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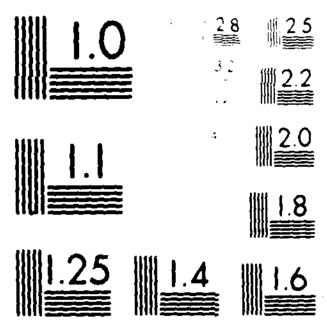

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MX SITING INVESTIGATION
GEOTECHNICAL EVALUATION

VERIFICATION STUDY
WAH WAH VALLEY, UTAH
VOLUME II - GEOTECHNICAL DATA

PREPARED FOR
BALLISTIC MISSILE OFFICE (BMO)
NORTON AIR FORCE BASE, CALIFORNIA

FUGRO NATIONAL, INC.
Consulting Engineers and Geologists

SECURITY CLASSIFICATION OF THIS PAGE (*When Data Entered*)

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20. ABSTRACT (*Continue on reverse side if necessary and identify by block number*)
This report contains the field data + laboratory test results from the Verification investigation of Wah Wah Valley. Includes basic data consisting of depth to rock, depth to water, seismic refraction surveys, electrical resistivity surveys, boring and trench logs, and soil profiles.

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SECURITY CLASSIFICATION OF THIS PAGE (*When Data Entered*)

FN-TR-27-WA-II

MX SITING INVESTIGATION
GEOTECHNICAL EVALUATION

VERIFICATION STUDY - WAH WAH VALLEY
UTAH

VOLUME II - GEOTECHNICAL DATA

Prepared for:

U. S. Department of the Air Force
Ballistic Missile Office (BMO)
Norton Air Force Base, California 92409

Prepared by:

Ertec Western, Inc.
3777 Long Beach Blvd.
Long Beach, California 90807

24 March 1981

FUGRO NATIONAL, INC.

FOREWORD

This volume of geotechnical data was compiled for the Department of the Air Force, Ballistic Missile Office (BMO), in compliance with Contract No. F04704-80-C-0006, CDRL Item 004A6. It contains the field data and laboratory test results from the Verification investigation of Wah Wah Valley. A synthesis of these data are available in Volume I (FN-TR-27-WA-I).

The data in each section of this volume are preceded by an explanation of the format and terms used in the compilation.

VOLUME II

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LIST OF DRAWINGS

1.0 ACTIVITY MAP AND GEOLOGIC STATION DATA

Explanation:

Locations of all field investigations are shown in Drawing II-1-1, Activity Location Map (in pocket). The geodetic and Universal Transverse Mercator (UTM) coordinates of all activities are listed in Table II-1-1.

Geologic stations were established at selected locations throughout the valley at which detailed descriptions of surficial basin-fill deposits or rock were recorded. All data taken on surficial basin-fill units at the geologic stations are listed in Table II-1-2, and an explanation of the column headings in the table is given below. An example of the field data sheet is shown on Figure II-1-1. At stations where rock descriptions were made, only geologic unit designations are listed. A general explanation of all geologic unit symbols used in Verification studies is included at the end of this section.

Column Heading Table II-1-2	Explanation
Station Number	Geologic stations are numbered sequentially. (e.g., NWAG001; N= Nevada-Utah Study Area; WA= Valley abbreviation [Wah Wah]; G= Geology Station).
Geol. Unit	Generalized mapped geomorphic unit (see explanation below). The grain-size designations (s, g, and f) indicate sand, gravel, and fines, respectively.
MPS (mm)	Average Maximum Particle Size in millimeters.
Grain Size (%B, %C, %G, %S, %F)	Estimated particle size distribution using the Unified Soil Classification System. Percentages of boulders (%B) and cobbles (%C) are based on the entire deposit, whereas percentages of gravel (%G), sand (%S), and fines (%F)

	are taken only on the fraction composed of particles less than three inches (76 mm) in diameter. Note: The symbol Ø (occasional) indicates between one and five percent; zero indicates zero to one percent.
*	Laboratory analyses of selected soil samples using the Unified Soil Classification System.
USCS	Soil class according to the Unified Soil Classification System.
Munsell Color	Soil color based on standard Munsell Soil Color Charts.
Source Rock Types	Rock types of coarse clasts (gravel) listed in order of abundance.
Physical Properties	Data listed in columns 6 through 15 address specific soil properties. These are listed below in parentheses following the column heading number and are also listed at the bottom of Table II-1-1. Data are coded with each numerical entry referring to a specific soil condition as listed below.

6	(Grain Shape)	1) Angular, 2) Subangular, 3) Subrounded, 4) Rounded, 5) Well rounded
7	(Moisture Content)	1) Dry, 2) Slightly Moist, 3) Moist, 4) Very Moist, 5) Wet
8	(Plasticity of Fines)	1) None, 2) Low, 3) Medium, 4) High
9	(Consistency)	Coarse grained: 1) Very Loose, 2) Loose, 3) Medium Dense, 4) Dense, 5) Very Dense Fine grained: 1)Soft, 2) Firm, 3) Stiff, 4) Hard
10	(Structure)	1) Non-stratified, 2) Stratified, tabular, 3) Stratified, other (lensed, cross bedded, discontinuous beds)
11	(Cementation-Induration)	1) None, 2) Weak, 3) Moderate, 4) Strong
12	(Depth to Cemented Layer)	Depth to layer (in centimeters) exhibiting cementation-induration described in Column 11 (above)

13 (Weathering of clasts)	1) Fresh, 2) Slight, 3) Moderate, 4) Very
14 (Soil Profile Development)	1) None (A-C profile), 2) Poor (incipient B-horizon), 3) Well (prominant B-horizon)
15 (Caliche Development)	1) None, 2) Stage I, 3) Stage II, 4) Stage III, 5) Stage IV
Terrain	Terrain information at the data location is broken into the following categories:
Drainage Depth (ft)	Average depth of drainages (in feet)
Drainage Width (ft)	Average width of drainages (in feet)
Slope (%)	Average slope of ground surface (in percent grade)
Sample	Number of samples taken

GENERALIZED GEOLOGIC UNITS

Explanation

Surficial Basin-fill Units

A1 Younger Fluvial Deposits - Major recent stream-channel and flood-plain deposits.

A2 Older Fluvial Deposits - Older incised stream-channel and flood-plain deposits in elevated terraces bordering major recent drainages.

A3 Eolian Deposits - Windblown deposits of sand occurring as either thin sheets (A3s) or dunes (A3d).

A4 Playa and Lacustrine Deposits - Deposits occurring in modern, active playas (A4) or in either inactive playas or older lake beds and abandoned shorelines associated with extinct lakes (A4o).

A5 Alluvial Fan Deposits - Alluvial deposits consisting of debris flow and water-laid alluvium near mountain fronts, grading into predominantly water-laid alluvium deposited in shifting distributary channels near the basin center. Younger (A5y), intermediate (A5i), and older (A5o) alluvial fans are differentiated by surface soil development, terrain conditions, and present depositional/erosional environment.

Grain sizes of these deposits (except A3 deposits, which are exclusively sandy) are indicated by a single letter (f, s, or g) following the geologic unit symbol. These letters indicate the predominant grain size and range of soil types according to the Unified Soil Classification System.

f - fine-grained clays and silts (ML, CL, MH, CH)

s - sands (SP, SW, SM, SC)

g - gravels (GP, GW, GM, GC)

ROCK UNITS

I Igneous (undifferentiated). Rocks formed by solidification of a molten or partially molten mass.

I1 Intrusive - Plutonic rocks formed by solidification of molten material beneath the surface (e.g., granite, granodiorite, diorite, gabbro).

I2 Extrusive (intermediate and acidic) - Volcanic rocks of intermediate and acidic compositon formed by solidification of molten material at or near the surface (e.g., rhyolite, latite, dacite, andesite).

I3 Extrusive (basic) - Volcanic rocks of basic composition, generally formed by solidification of molten materials at or near the surface (e.g., basalt).

I4 Extrusive (pyroclastic) - Rocks formed by accumulation of volcanic ejecta (e.g., ash, tuff, welded tuff, agglomerate).

S Sedimentary (undifferentiated) - Rocks formed by accumulation of clastic solids, organic solids, and/or chemically precipitated minerals.

S1 Arenaceous and/or Siliceous Rocks - Composed of sand-size particles (e.g., sandstone, orthoquartzite) or of cryptocrystalline silica (e.g., opal, chert).

S2 Carbonate Rocks - Composed predominantly of calcium-carbonate detritus or chemical precipitates (e.g., limestone, dolomite, chalk).

S3 Argillaceous Rocks - Composed of clay and silt-sized particles (e.g., siltstone, shale, claystone).

S4 Evaporite Rocks - Precipitated from solution as a result of evaporation (e.g., halite, gypsum, anhydrite, sylvite).

S5 Coarse Clastic Rocks - Composed of gravel-sized or larger clasts (e.g., conglomerate, breccia).

M Metamorphic (undifferentiated) - Rocks formed through recrystallization in the solid state of preexisting rocks by heat and pressure (e.g., gneiss, schist, hornfels, metaquartzite).

WAH WAH VALLEY ACTIVITY LOCATIONS

ACT ID.		GEODETIC COORD. LAT. DEG	LAT. MIN	LONG. DEG	LONG. MIN	UTM COORD. ZONE 12 N(KM)	E(KM)
BORING SITES							
WA-	B01	38	41.02	113	22.38	4284.15	293.58
WA-	B02	38	35.63	113	20.65	4274.10	295.84
WA-	B03	38	33.25	113	25.05	4269.86	289.33
WA-	B04	38	26.27	113	24.45	4256.94	289.87
WA-	B05	38	29.51	113	28.42	4263.07	284.25
WA-	B06	38	44.38	113	23.11	4290.38	292.69
WA-	B07	38	42.28	113	17.13	4286.28	301.26
CPT SITES							
WA-	C01	38	43.42	113	19.93	4288.48	297.25
WA-	C02	38	43.81	113	20.88	4289.24	295.90
WA-	C03	38	44.11	113	22.01	4289.84	294.27
WA-	C04	38	44.38	113	23.11	4290.38	292.69
WA-	C05	38	29.69	113	29.04	4263.44	283.37
WA-	C06	38	29.51	113	28.42	4263.07	284.25
WA-	C07	38	28.98	113	27.43	4262.07	285.67
WA-	C08	38	28.56	113	26.50	4261.25	286.99
WA-	C09	38	28.25	113	25.25	4260.64	288.81
WA-	C10	38	27.89	113	24.07	4259.92	290.50
WA-	C11	38	27.07	113	24.25	4258.41	290.20
WA-	C12	38	26.27	113	24.45	4256.94	289.87
WA-	C13	38	25.45	113	25.35	4255.45	288.52
WA-	C14	38	24.56	113	26.25	4253.84	287.16
WA-	C15	38	24.10	113	26.87	4253.02	286.25
WA-	C16	38	23.57	113	27.54	4252.05	285.25
WA-	C17	38	23.48	113	24.86	4251.80	289.13
WA-	C18	38	22.44	113	24.76	4249.86	289.23
WA-	C19	38	21.75	113	25.51	4248.61	288.11
WA-	C20	38	23.73	113	23.90	4252.22	290.55
WA-	C21	38	23.84	113	23.02	4252.38	291.84
WA-	C22	38	23.45	113	22.22	4251.63	292.98
WA-	C23	38	23.11	113	21.42	4250.97	294.13
WA-	C24	38	23.32	113	20.62	4251.33	295.31
WA-	C25	38	26.14	113	17.86	4256.44	299.46
WA-	C26	38	26.34	113	18.79	4255.85	298.10
WA-	C27	38	26.84	113	20.09	4257.82	296.24
WA-	C28	38	27.18	113	21.32	4258.50	294.46
WA-	C29	38	27.54	113	22.72	4259.22	292.45
WA-	C30	38	34.04	113	26.65	4271.39	287.05

GEOGRAPHIC COORDINATES OF ACTIVITIES
WAH WAH VALLEY, UTAH

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE — BMO

TABLE II-1-1
1 OF 8

FUGRO NATIONAL, INC.

WAH WAH VALLEY ACTIVITY LOCATIONS

ACT ID.	GEODETIC COORD. LAT. DEG	LAT. MIN	LONG. DEG	LONG. MIN	UTM COORD. ZONE 12 N(KM)	E(KM)
WA- C31	38	33.71	113	26.05	4270.75	287.91
WA- C32	38	33.25	113	25.05	4269.86	289.33
WA- C33	38	32.73	113	24.11	4268.87	290.68
WA- C34	38	31.73	113	23.37	4266.99	291.70
WA- C35	38	31.54	113	22.43	4266.60	293.06
WA- C36	38	31.53	113	20.83	4266.53	295.38
WA- C37	38	31.85	113	20.08	4267.10	296.48
WA- C38	38	35.63	113	20.65	4274.10	295.84
WA- C39	38	35.84	113	18.39	4274.41	299.14
WA- C40	38	35.88	113	19.01	4274.50	298.24
WA- C41	38	35.94	113	19.79	4274.65	297.10
WA- C42	38	36.08	113	21.75	4274.97	294.27
WA- C43	38	36.11	113	22.76	4275.08	292.80
WA- C44	38	37.00	113	22.95	4276.73	292.57
WA- C45	38	37.65	113	23.03	4277.93	292.49
WA- C46	38	38.44	113	23.30	4279.39	292.13
WA- C47	38	40.44	113	17.83	4282.89	300.16
WA- C48	38	40.74	113	18.93	4283.48	298.58
WA- C49	38	40.81	113	19.95	4283.66	297.10
WA- C50	38	40.89	113	21.08	4283.85	295.47
WA- C51	38	41.02	113	22.38	4284.15	293.58
WA- C52	38	41.07	113	23.53	4284.28	291.92
WA- C53	38	41.19	113	24.59	4284.53	290.39
WA- C54	38	41.22	113	25.77	4284.63	288.68
WA- C55	38	40.83	113	26.82	4283.95	287.14
WA- C56	38	40.54	113	27.60	4283.45	285.99
WA- C57	38	39.69	113	29.93	4281.97	282.57
WA- C58	38	40.01	113	29.22	4282.53	283.61
WA- C59	38	40.23	113	28.41	4282.91	284.81
WA- C60	38	43.14	113	19.09	4287.94	298.46
WA- C61	38	42.71	113	17.99	4287.10	300.04
WA- C62	38	42.28	113	17.13	4286.28	301.26
WA- C63	38	42.10	113	15.96	4285.90	302.94
WA- C64	38	41.87	113	14.92	4285.43	304.44
WA- C65	38	41.69	113	14.05	4285.08	305.70
WA- C66	38	41.83	113	12.72	4285.28	307.62
WA- C67	38	41.97	113	11.96	4285.53	306.74
WA- C68	38	41.89	113	7.53	4285.22	315.16
WA- C69	38	41.63	113	8.78	4285.16	313.34
WA- C70	38	41.76	113	9.93	4285.07	311.68
WA- C71	38	41.87	113	11.05	4285.30	310.06
WA- C72	38	29.86	113	29.40	42[illegible].76	282.95

**GEOGRAPHIC COORDINATES OF ACTIVITIES
WAH WAH VALLEY, UTAH**

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE — BMO

TABLE II-1-1
2 OF 8

FUGRO NATIONAL, INC.

WAH WAH VALLEY ACTIVITY LOCATIONS

ACT ID.	GEODETIC COORD. LAT. DEG	LAT. MIN	LONG. DEG	LONG. MIN	UTM COORD. ZONE 12 N(KM)	E(KM)
FIELD CBR TESTS						
WA- F01	38	28.25	113	25.25	4260.64	288.81
WA- F02	38	27.54	113	22.72	4259.22	292.45
WA- F03	38	24.56	113	26.25	4253.84	287.16
WA- F04	38	26.27	113	24.45	4256.94	289.87
WA- F05	38	40.74	113	18.93	4283.48	298.58
WA- F06	38	37.00	113	22.95	4276.73	292.57
WA- F07	38	35.63	113	20.65	4274.10	295.84
WA- F08	38	32.73	113	24.11	4268.87	290.68
GEOLOGIC STATIONS						
WA-GS01	38	43.49	113	19.91	4288.62	297.28
WA-GS02	38	41.26	113	25.50	4284.70	289.08
WA-GS03	38	41.06	113	22.11	4284.20	293.98
WA-GS04	38	41.01	113	19.40	4284.01	297.91
WA-GS05	38	42.89	113	19.93	4287.51	297.23
WA-GS06	38	43.72	113	20.55	4289.07	296.37
WA-GS07	38	43.94	113	22.13	4289.53	294.10
WA-GS08	38	43.02	113	21.14	4287.79	295.48
WA-GS09	38	44.27	113	21.09	4290.11	295.61
WA-GS10	38	41.89	113	15.46	4285.50	303.66
WA-GS11	38	41.58	113	13.60	4284.85	306.34
WA-GS12	38	45.89	113	17.97	4292.99	300.21
WA-GS13	38	43.26	113	18.36	4288.14	299.53
WA-GS14	38	44.05	113	18.13	4289.58	299.90
WA-GS15	38	38.83	113	28.63	4280.33	284.41
WA-GS16	38	41.42	113	25.94	4285.01	288.44
WA-GS17	38	39.57	113	30.37	4281.76	281.93
WA-GS18	38	39.13	113	29.57	4280.93	283.06
WA-GS19	38	39.62	113	24.42	4281.63	290.56
WA-GS20	38	38.29	113	22.03	4279.08	293.97
WA-GS21	38	41.80	113	10.33	4285.15	311.09
WA-GS22	38	39.95	113	12.48	4281.80	307.89
WA-GS23	38	39.45	113	13.00	4280.90	307.12
WA-GS24	38	40.54	113	17.93	4283.08	300.02
WA-GS25	38	34.22	113	23.35	4271.60	291.85
WA-GS26	38	33.36	113	22.38	4269.98	293.23
WA-GS27	38	33.91	113	21.00	4270.93	295.25
WA-GS28	38	33.86	113	19.76	4270.80	297.05
WA-GS29	38	33.83	113	19.43	4270.74	297.53

GEOGRAPHIC COORDINATES OF ACTIVITIES
WAH WAH VALLEY, UTAH

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE — BMO

TABLE II-1-1
3 OF 8

FUGRO NATIONAL, INC.

WAH WAH VALLEY ACTIVITY LOCATIONS

ACT ID.	GEODETIC COORD. LAT. DEG	LAT. MIN	LONG. DEG	LONG. MIN	UTM COORD. ZONE 12 N(KM)	E(KM)
WA-GS30	38	31.42	113	21.72	4266.36	294.09
WA-GS31	38	32.13	113	18.53	4267.55	298.76
WA-GS32	38	32.93	113	20.56	4269.10	295.85
WA-GS33	38	37.38	113	17.60	4277.23	300.35
WA-GS34	38	37.76	113	19.38	4278.00	297.78
WA-GS35	38	25.83	113	20.62	4255.98	295.42
WA-GS36	38	25.49	113	19.34	4255.29	297.27
WA-GS37	38	24.94	113	20.71	4254.33	295.25
WA-GS38	38	23.38	113	20.16	4251.43	295.98
WA-GS39	38	20.32	113	22.40	4245.85	292.57
WA-GS40	38	24.11	113	22.57	4252.87	292.50
WA-GS41	38	25.21	113	23.27	4254.92	291.53
WA-GS42	38	27.04	113	24.17	4258.35	290.31
WA-GS43	38	25.04	113	25.13	4254.69	288.83
WA-GS44	38	23.73	113	25.98	4252.30	287.52
WA-GS45	38	22.52	113	24.74	4250.01	289.27
WA-GS46	38	25.53	113	28.14	4255.70	284.46
WA-GS47	38	27.61	113	27.44	4259.52	285.59
WA-GS48	38	28.15	113	27.38	4260.52	285.71
WA-GS49	38	26.31	113	29.02	4257.19	283.22
WA-GS50	38	31.93	113	24.44	4267.40	290.16
WA-GS51	38	33.06	113	24.50	4269.50	290.13
WA-GS52	38	31.08	113	26.28	4265.91	287.44
WA-GS53	38	30.29	113	28.21	4264.51	284.60
WA-GS54	38	30.20	113	31.04	4264.45	280.49
WA-GS55	38	36.50	113	23.12	4275.81	292.30
WA-GS56	38	36.37	113	23.78	4275.59	291.33
WA-GS57	38	36.13	113	24.78	4275.19	289.87
WA-GS58	38	35.12	113	27.15	4273.41	286.37
WA-GS59	38	34.28	113	27.85	4271.89	285.33
WA-GS60	38	30.19	113	30.22	4264.41	281.68
WA-GS61	38	29.15	113	27.06	4262.36	286.21
WA-GS62	38	29.10	113	23.06	4262.12	292.03
WA-GS63	38	30.20	113	21.46	4264.10	294.41
WA-GS64	38	26.20	113	18.11	4256.57	299.09
WA-GS65	38	27.03	113	20.17	4258.17	296.14
WA-GS66	38	35.94	113	23.34	4274.78	291.95
WA-GS67	38	38.80	113	23.54	4280.07	291.80
WA-GS68	38	38.68	113	25.92	4279.94	288.34
WA-GS69	38	25.66	113	26.18	4255.87	287.33
WA-GS70	38	22.99	113	28.11	4251.02	284.39
WA-GS71	38	19.13	113	23.50	4243.70	290.92

GEOGRAPHIC COORDINATES OF ACTIVITIES
WAH WAH VALLEY, UTAH

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE — BMO

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FUGRO NATIONAL, INC.

WAH WAH VALLEY ACTIVITY LOCATIONS

ACT ID.	GEODETIC COORD. LAT. DEG	MIN	LONG. DEG	MIN	UTM COORD. ZONE 12 N(KM)	E(KM)
WA-GS72	38	23.94	113	20.82	4252.48	295.04
WA-GS73	38	14.70	113	24.78	4235.55	288.83

REFRACTION LINES

WA- S01	38	44.11	113	22.01	4289.84	294.27
WA- S02	38	29.86	113	29.40	4263.76	282.85
WA- S03	38	28.98	113	27.43	4262.07	285.67
WA- S04	38	23.32	113	20.62	4251.33	295.31
WA- S05	38	26.14	113	17.86	4256.44	299.46
WA- S06	38	23.57	113	27.54	4252.05	285.25
WA- S07	38	20.91	113	25.14	4247.05	288.60
WA- S08	38	20.38	113	22.74	4245.97	292.08
WA- S09	38	28.29	113	27.28	4260.79	285.86
WA- S10	38	26.51	113	29.61	4257.58	282.38
WA- S11	38	39.69	113	29.93	4281.97	282.57
WA- S12	38	38.44	113	23.30	4279.39	292.13
WA- S13	38	32.06	113	19.22	4267.45	297.75
WA- S14	38	34.27	113	27.56	4271.85	285.75
WA- S15	38	18.21	113	23.96	4242.02	290.19
WA- S16	38	41.69	113	14.05	4285.08	305.70
WA- S17	38	43.14	113	19.09	4287.94	298.46
WA- S18	38	41.89	113	7.53	4285.22	315.16
WA- S19	38	39.18	113	10.83	4280.32	310.25
WA- S20	38	39.98	113	13.29	4281.88	306.73
WA- S21	38	40.05	113	14.42	4282.06	305.08

RESISTIVITY LINES

WA- R01	38	44.11	113	22.01	4289.84	294.27
WA- R02	38	29.86	113	29.40	4263.76	282.85
WA- R03	38	28.98	113	27.43	4262.07	285.67
WA- R04	38	23.32	113	20.62	4251.33	295.31
WA- R05	38	26.14	113	17.86	4256.44	299.46
WA- R06	38	23.57	113	27.54	4252.05	285.25
WA- R07	38	20.91	113	25.14	4247.05	288.60
WA- R08	38	20.38	113	22.74	4245.97	292.08
WA- R09	38	28.29	113	27.28	4260.79	285.86
WA- R10	38	26.51	113	29.61	4257.58	282.38
WA- R11	38	39.69	113	29.93	4281.97	282.57
WA- R12	38	38.44	113	23.30	4279.39	292.13
WA- R13	38	32.06	113	19.22	4267.45	297.75

GEOGRAPHIC COORDINATES OF ACTIVITIES
WAH WAH VALLEY, UTAH

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE — BMO

TABLE II-1-1
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FUGRO NATIONAL, INC.

WAH WAH VALLEY ACTIVITY LOCATIONS

ACT ID.	GEODETIC COORD. LAT. DEG	LAT. MIN	LONG. DEG	LONG. MIN	UTM COORD. ZONE 12 N(KM)	E(KM)
WA- R14	38	34.27	113	27.56	4271.85	285.75
WA- R15	38	18.21	113	23.96	4242.02	290.19
WA- R16	38	41.69	113	14.05	4285.08	305.70
WA- R17	38	43.14	113	19.09	4287.94	298.46
WA- R18	38	41.89	113	7.53	4285.22	315.16
WA- R19	38	39.18	113	10.83	4280.32	310.25
WA- R20	38	39.98	113	13.29	4281.88	306.73
WA- R21	38	40.05	113	14.42	4282.06	305.08

SURFICIAL SOIL SAMPLES

WA-CS01	38	43.42	113	19.93	4288.48	297.25
WA-CS04	38	44.38	113	23.11	4290.38	292.69
WA-CS05	38	29.69	113	29.04	4263.44	283.37
WA-CS08	38	28.56	113	26.50	4261.25	286.99
WA-CS10	38	27.89	113	24.07	4259.92	290.50
WA-CS11	38	27.07	113	24.25	4258.41	290.20
WA-CS13	38	25.45	113	25.35	4255.45	288.52
WA-CS15	38	24.10	113	26.87	4253.02	286.25
WA-CS18	38	22.44	113	24.76	4249.86	289.23
WA-CS20	38	23.73	113	23.90	4252.22	290.55
WA-CS23	38	23.11	113	21.42	4250.97	294.13
WA-CS26	38	26.34	113	18.79	4256.85	298.10
WA-CS28	38	27.18	113	21.32	4258.50	294.46
WA-CS30	38	34.04	113	26.65	4271.39	287.05
WA-CS32	38	33.25	113	25.05	4269.86	289.33
WA-CS34	38	31.73	113	23.37	4266.99	291.70
WA-CS37	38	31.85	113	20.08	4267.10	296.48
WA-CS41	38	35.94	113	19.79	4274.65	297.10
WA-CS43	38	36.11	113	22.76	4275.08	292.80
WA-CS45	38	37.65	113	23.03	4277.93	292.49
WA-CS47	38	40.44	113	17.83	4282.89	300.16
WA-CS49	38	40.81	113	19.95	4283.66	297.10
WA-CS52	38	41.07	113	23.53	4284.28	291.92
WA-CS54	38	41.22	113	25.77	4284.63	288.68
WA-CS56	38	40.54	113	27.60	4283.45	285.99
WA-CS58	38	40.01	113	29.22	4282.53	283.61
WA-CS61	38	42.71	113	17.99	4287.10	300.04
WA-CS63	38	42.10	113	15.96	4285.90	302.94
WA-CS65	38	41.69	113	14.05	4285.08	305.70
WA-CS67	38	41.97	113	11.96	4285.53	308.74
WA-CS69	38	41.83	113	8.78	4285.16	313.34

GEOGRAPHIC COORDINATES OF ACTIVITIES
WAH WAH VALLEY, UTAH

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE — BMO

TABLE II-1-1
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FUGRO NATIONAL, INC.

WAH WAH VALLEY ACTIVITY LOCATIONS

ACT ID.	GEODETIC COORD. LAT. DEG	LAT. MIN	LONG. DEG	LONG. MIN	UTM COORD. ZONE 12 N(KM)	E(KM)
WA-CS71	38	41.87	113	11.05	4285.30	310.06

TEST PITS

ACT ID.	LAT. DEG	LAT. MIN	LONG. DEG	LONG. MIN	N(KM)	E(KM)
WA- P01	38	43.81	113	20.88	4289.24	295.90
WA- P02	38	29.86	113	29.40	4263.76	282.85
WA- P03	38	28.98	113	27.43	4262.07	285.67
WA- P04	38	24.56	113	26.25	4253.84	287.16
WA- P05	38	23.45	113	22.22	4251.63	292.98
WA- P06	38	26.84	113	20.09	4257.82	296.24
WA- P07	38	27.54	113	22.72	4259.22	292.45
WA- P08	38	31.53	113	20.83	4266.53	295.38
WA- P09	38	32.73	113	24.11	4268.87	290.68
WA- P10	38	36.08	113	21.75	4274.97	294.27
WA- P11	38	35.84	113	18.39	4274.41	299.14
WA- P12	38	40.83	113	26.82	4283.95	287.14
WA- P13	38	39.69	113	29.93	4281.97	282.57
WA- P14	38	41.19	113	24.59	4284.53	290.39
WA- P15	38	40.89	113	21.08	4283.85	295.47
WA- P16	38	40.74	113	18.93	4283.48	298.58
WA- P17	38	43.14	113	19.09	4287.94	298.46
WA- P18	38	41.87	113	14.92	4285.43	304.44
WA- P19	38	41.83	113	12.72	4285.28	307.62
WA- P20	38	41.76	113	9.93	4285.07	311.68

TRENCH SITES

ACT ID.	LAT. DEG	LAT. MIN	LONG. DEG	LONG. MIN	N(KM)	E(KM)
WA- T01	38	44.11	113	22.01	4289.84	294.27
WA- T02	38	29.51	113	28.42	4263.07	284.25
WA- T03	38	28.25	113	25.25	4260.64	288.81
WA- T04	38	26.27	113	24.45	4256.94	289.87
WA- T05	38	23.57	113	27.54	4252.05	285.25
WA- T06	38	23.48	113	24.86	4251.80	289.13
WA- T07	38	21.75	113	25.51	4248.61	288.11
WA- T08	38	23.84	113	23.02	4252.38	291.84
WA- T09	38	23.32	113	20.62	4251.33	295.31
WA- T10	38	26.14	113	17.86	4256.44	299.46
WA- T11	38	31.54	113	22.43	4266.60	293.06
WA- T12	38	32.06	113	19.22	4267.45	297.75
WA- T13	38	33.71	113	26.05	4270.75	287.91
WA- T14	38	34.27	113	27.56	4271.85	285.75
WA- T15	38	35.63	113	20.65	4274.10	295.84

GEOGRAPHIC COORDINATES OF ACTIVITIES
WAH WAH VALLEY, UTAH

MX SITING INVESTIGATION

DEPARTMENT OF THE AIR FORCE — BMO

TABLE II-1-1
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FUGRO NATIONAL, INC.

WAH WAH VALLEY ACTIVITY LOCATIONS

ACT ID.	GEODETIC COORD. LAT. DEG	LAT. MIN	LONG. DEG	LONG. MIN	UTM COORD. ZONE 12 N(KM)	E(KM)
WA- T16	38	37.00	113	22.95	4276.73	292.57
WA- T17	38	40.23	113	28.41	4282.91	284.81
WA- T18	38	41.02	113	22.38	4284.15	293.58
WA- T19	38	42.28	113	17.13	4286.28	301.26
WA- T20	38	41.89	113	7.53	4285.22	315.16
WATER WELL SITES						
WA- W01	38	40.75	113	18.19	4283.49	299.65
WA- W02	38	26.41	113	24.35	4257.20	290.03
WA- W03	38	23.33	113	24.95	4251.52	289.00
WA- W04	38	23.88	113	23.24	4252.46	291.52
WA- W05	38	21.00	113	23.67	4247.15	290.75
WA- 001	38	43.87	113	15.07	4289.14	304.32
WA- 002	38	43.33	113	8.03	4287.91	314.50
WA- 003	38	43.11	113	11.57	4287.61	309.36
WA- 007	38	42.28	113	17.13	4286.28	301.26
WA-WR01	38	31.53	113	22.06	4266.58	293.60
WA-WR02	38	25.76	113	25.00	4256.00	289.05
WA-WRT2	38	25.61	113	25.16	4255.75	288.81

GEOGRAPHIC COORDINATES OF ACTIVITIES
WAH WAH VALLEY, UTAH

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE — BMO

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FUGRO NATIONAL, INC.

STATION NUMBER	GEOL UNIT	MPS MM	%B	%C	%G	%S	%F	USCS	MUNSELL COLOR	SOURCE ROCK TYPES	6	7	8	9	10	11	12	13	14	15	DRAINAGE (FT) DEPTH	DRAINAGE (FT) WIDTH	SLOPE (%)	SAMPLE
NWAG001	A5YS	60	0	0	0	100	0	SP	7.5YR4/4		3	3	1	2	1	1		3	1	2	0.7	3.3	2	0
NWAG002	A5YS	50	0	0	7	68	25	SM	10.0YR5/4	S2	2	1	1	2	1	1		2	1	1			1	1
NWAG003	A5IG	110	0	10	50	40	10	GP-GM		S2	2	1	1	2	1	1		2	1	2	6.6	9.8	2	0
NWAG004	A40S	20	0	0	5	85	10	SP-SM	10.0YR5/4	S1 S2	2	1	1	2	1	1		2	1	1			2	0
NWAG005	A5YS	35	0	0	5	91	4	SP	10.0YR4/4	S2	2	1	1	1	1	1		2	1	1			2	1
NWAG006	A40G	45	0	10	75	20	5	GP-GM		S2 S1	2	1	1	2	3	1		2	1	1				0
NWAG007	A5YS	20	0	0	5	90	5	SP-SM	10.0YR5/4	S2	2	1	1	3	1	1		2	1	1	1.6	3.3	1	0
NWAG008	A40S	30	0	0	5	90	5	SP-SM	10.0YR5/4	S2	2	1	1	3	1	1		2	1	2	3.3	3.3	2	0
NWAG009	A5YG	110	0	10	60	35	5	GP-GM		S2 S1 I3	2	1	1	3	3	1		2	1	1	1.6	3.3	2	0
NWAG010	A40S		0	0	0	95	5	SP-SM	10.0YR5/4		3	1	1	2	1	1		2	1	1				0
NWAG011	S1																							1
NWAG012	A40S	35	0	0	5	90	5	SP-SM	10.0YR5/4	S2	2	1	1	3	1	1		2	1	2	1.6	3.3	3	0
NWAG013	A40S	30	0	0	0	100	0	SP	10.0YR5/4		2	1	1	3	1	1		2	2	2			1	0
NWAG014	A40S		0	0	14	44	42 *	SM	10.0YR5/4			1	2	8	1	1			1	1	1.6	3.3	1	1
NWAG015	A5IS	160	0	5	33	40	27 *	SM	10.0YR5/6	S2	2	2	2	2	1	1		2	1	2	4.0	20.0	4	1
NWAG016	S2																							1
NWAG017	S2																							1
NWAG018	A5IS	100	0	10	25	50	25	SM	10.0YR4/4	S2	2	2	2	3	1	1		2	1	2	6.0	480.0	4	0
NWAG019	A5YG	70	0	0	31	22	47 *	GM	10.0YR4/4	S2	2	3	3	3	1	1		2	1	2	1.0	3.0	1	1
NWAG020	A40S	100	0	0	10	85	5	SP-SM	10.0YR5/4	S2	2	2	2	3	1	1		2	1	2	4.0	30.0	1	0
NWAG021	A40S	140	0	5	15	49	36 *	SM	10.0YR4/4	S1 S2	2	2	2	2	1	1		2	1	2	8.0	50.0	3	1
NWAG022	A40G	70	0	0	49	31	20 *	GM		S1	2	2	3	2	1	1		2	1	2	10.0	180.0	4	1
NWAG023	A5IG	170	0	5	60	35	5	GP-GM		S1	2	2	2	2	1	1		2	1	3	30.0	380.0	5	0
NWAG024	A4 F		0	0	0	3	97 *	ML	10.0YR7/3			1	2	7	1	1			1	1	0.0	0.0	0	1
NWAG025	A5YS	70	0	0	2	61	37 *	SM	10.0YR4/4	S2	2	2	1	3	1	1		2	1	2	0.5	1.0	1	1
NWAG026	A5YF	10	0	0	2	16	82 *	ML	10.0YR8/4	S2		2	2	7	1	1			1	2	0.5	1.0	1	1
NWAG027	A5YS	20	0	0	2	73	25 *	SM	10.0YR4/4	S1	2	2	1	2	1	1		2	1	2	1.0	2.0	1	1
NWAG028	A40G	70	0	0	52	17	31 *	GM		S1 S2	2	1	3	2	1	1		2	1	2				1
NWAG029	A5IS	90	0	0	34	44	22 *	SM	10.0YR4/4	S1 S2	2	2	1	2	1	1		2	1	2	13.0	20.0	11	1
NWAG030	A5YF	0	0	0	0	32	68 *	CL	10.0YR4/4			2	2	8	3	1			1	1	0.5	300.0	1	1
NWAG031	S2																							1
NWAG032	A40S	100	0	5	23	47	30 *	SM	10.0YR4/4	S2 S1	2	2	1	3	1	1		2	1	2	4.0	100.0	5	1
NWAG033	A40S	140	0	10	11	56	33 *	SM	10.0YR4/4	S1	3	2	1	3	1	1		2	1	2	1.0	4.0	8	1
NWAG034	A40S	20	0	0	5	85	10	SP-SM	10.0YR6/6	S1	2	2	1	3	1	1		2	1	1	0.3	1.0	2	0
NWAG035	A5YS	129	0	0	5	90	5	SP-SM	10.0YR3/4	S2	2	2	1	4	1	3		2	1	3	0.5	10.0	2	0
NWAG036	I2																							0
NWAG037	A5YS	48	0	0	5	85	10	SP-SM	10.0YR4/4	I2	2	2	1	3	1	4		2	2	2			4	1
NWAG038	I2																							1
NWAG039	I2																							1
NWAG040	A5YS	5	0	0	10	85	5	SP-SM	10.0YR4/4	I2	2	2	1	3	1	1		2	1	2			1	0
NWAG041	A40S	13	0	0	5	88	7	SP-SM	10.0YR5/6	I2 I3	2	2	1	3	1	1		2	1	1			0	0
NWAG042	A40S	53	0	0	5	90	5	SP-SM	10.0YR3/4	I3 S2	2	3	1	3	2	1			2	1	100.3	1.0	0	0
NWAG043	A5YS	100	0	0	12	71	17 *	SM	10.0YR3/2	I2 I3	2	2		3	3	3		3	1	1	1.0	3.0	0	1
NWAG044	A5IS	39	0	0	2	93	5	SP-SM	10.0YR4/3	I2 S1	2	2	1	3	1	2		2	1	2			3	0
NWAG045	A5IS	16	0	0	5	90	5	SP-SM	10.0YR4/4	I2 I3 S1	2	2	1	3	1	3		3	1	1			2	0
NWAG046	A5YS	230	0	0	2	93	5	SP-SM	10.0YR4/4	S2	2	3	1	3	1	3		3	1	1			2	0
NWAG047	A40S	75	0	0	11	70	19 *	SM	10.0YR4/4	S2 I2	2	3	1	3	1	3		3	1	2	3.0	9.0	2	1
NWAG048	I3																							1
NWAG049	A5IS	120	0	5	10	85	5	SP-SM	10.0YR4/6	S2	2	3	1	3	1	3		2	1	2	2.0	6.0	3	0
NWAG050	A4 F		0	0	0	43	57 *	CL	10.0YR5/4			2	2	7	1	1			1	1	0.5	3.0	1	1
NWAG051	A40S	70	0	0	33	47	20 *	SM	10.0YR3/4	S2 I2	2	2	1	3	1	1		2	1	2	4.0	10.0	3	1
NWAG052	A5YS	120	0	2	34	46	20 *	SM	10.0YR4/4	I2 S2	2	2	1	3	1	1		2	1	2	3.0	150.0	4	1
NWAG053	A1 S	90	0	0	40	60	0	SP	10.0YR3/3	S1 I2	2	2	1	2	1	1		2	1	1	15.0	400.0	2	1
NWAG054	A50G	80	0	0	45	35	20	GM		S1	2	2	2	3	1	1		2	1	2	50.0	400.0	5	0
NWAG055	A40S	50	0	0	1	87	12 *	SP-SM	10.0YR4/3	S1 I2	3	2	1	2	1	1		2	1	2	0.5	8.0	1	1
NWAG056	A5YS	130	0	10	23	42	35 *	SM	10.0YR4/4	S1	2	2	2	3	1	1		2	1	2	0.5	2.0	2	1
NWAG057	A5YS	210	0	15	24	44	32 *	SM	10.0YR4/4	S1 I2	2	2	2	3	1	1		2	1	2	0.5	2.0	3	1
NWAG058	A5IG	150	0	5	42	37	21 *	GM	10.0YR4/4	S1	2	2	1	2	1	2	46	2	1	2	4.0	30.0	3	1
NWAG059	I2																							1
NWAG060	I2																							1
NWAG061	A5YS	90	0	5	40	50	10	SP-SM	10.0YR4/4	S1 I2	2	2	1	3	1	1		2	1	3	0.5	3.0	3	0
NWAG062	A40S	40	0	0	25	72	3	SP	10.0YR5/4	I2 S2 S1	2	2	1	3	1	1		2	1	1	3.0	40.0	2	0
NWAG063	A5YS	25	0	0	3	76	21 *	SM	10.0YR3/4	I2 S1	2	2	1	3	1	1		2	1	2	3.0	20.0	4	1
NWAG064	I2																							1
NWAG065	A5YS	200	0	7	14	66	20 *	SM	10.0YR3/4	I2 S2 S1	2	2	1	3	1	1		2	1	2	2.1	25.0	4	1
NWAG066	A40F		0	0	0	0	100	ML	2.5Y 8/2			2	2	8	2	1			1	1	3.0	10.0	1	1
NWAG067	S2																							1
NWAG068	A40F	200	0	5	4	20	76	ML	10.0YR5/6	S2		2	2	7	1	1			1	2	3.0	10.0	2	1
NWAG069	A5YS	0	0	0	1	84	15	SM	10.0YR4/4	I3	2	1	2	3	1	3	8	2	1	2	0.0	0.0	1	0
NWAG070	I3																							1
NWAG071	A5IS	140	0	1	10	80	10	SP-SM	10.0YR4/3	I3	2	1	2	3	1	1		2	1	3	0.5	6.0	2	0
NWAG072	A5IS	46	0	0	10	80	10	SP-SM	10.0YR3/3	I2 I4	2	1	1	3	1	1		2	2	2	0.5	4.0	2	0
NWAG073	A5IS	78	0	0	25	70	5	SP-SM	10.0YR3/3	I2	2	1	1	2	1	1		2	1	2	4.0	10.0	2	0

EXPLANATION: PHYSICAL PROPERTIES

6: GRAIN SHAPE
7: MOISTURE CONTENT
8: PLASTICITY OF FINES
9: CONSISTENCY
10: STRUCTURE
11: CEMENTATION-INDURATION
12: DEPTH TO CEMENTED LAYER (CM)
13: WEATHERING OF CLASTS
14: SOIL PROFILE DEVELOPMENT
15: CALICHE DEVELOPMENT
NOTE: 0=OCCASIONAL (1-5%)
NOTE: *=LAB DATA

GEOLOGIC STATION DATA WAH WAH VALLEY, UTAH

MX SITING INVESTIGATION

DEPARTMENT OF THE AIR FORCE — BMO

TABLE II-1-2

FUGRO NATIONAL, INC.

Station No. ______ Described Geol. Unit ______

Date ______ Complete Geol. Unit ______

Observers ______ Field Photo Nos. ______

Air Photo No. ______ Sample (No=0, Yes=1) ______

SOIL PROPERTIES

1. Grain-Size Distribution: MPS (mm) - grain size of coarsest fraction; boulders and cobbles - percent of total; gravel, sand, and fines - percent less than 3 inches.
2. USCS Symbol
3. Descriptive Name (one adjective only) ______
4. Munsell Color (not applicable to gravel)
5. Lithology of gravel, cobbles, boulders: give rock type (I1, I2, M, etc.) in order of abundance.
6. Grain Shape (coarse grained soil only): 1) Angular, 2) Subangular, 3) Subrounded, 4) Rounded, 5) Well-rounded.
7. Moisture Content: 1) Dry, 2) Slightly moist, 3) Moist, 4) Very moist, 5) Wet
8. Plasticity of Fines: 1) None, 2) Low, 3) Medium, 4) High
9. Consistency:
   Coarse-grained: 1) Very Loose, 2) Loose, 3) Medium Dense, 4) Dense, 5) Very Dense
   Fine-grained: 6) Soft, 7) Firm, 8) Stiff, 9) Hard
10. Structure: 1) Non-stratified (homogeneous), 2) Stratified-tabular, 3) Stratified-other; if 3) describe ______
11. Cementation-Induration: 1) None, 2) Weak, 3) Moderate, 4) Strong
12. Depth to Cemented Layer (cm)
13. Weathering of boulders, cobbles, and gravel: 1) Fresh, 2) Slight, 3) Moderate, 4) Very
14. Degree of Soil Profile Development: 1) None (A-C profile), 2) Poor (incipient B-horizon), 3) Well (prominant B-horizon)
    Describe ______
15. Degree of Caliche Development: 1) None, 2) Stage I, 3) Stage II, 4) Stage III, 5) Stage IV
    Describe ______

FIELD DATA SHEET
WAH WAH VALLEY, UTAH

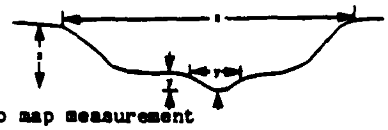
MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE — BMO

FIGURE II-1-1
1 OF 2

FUGRO NATIONAL, INC.

TERRAIN

16. Average Drainage Depth (ft)



17. Average Drainage Width (ft)

18. Slope (percent) - field and/or topo map measurement

FIELD MAP

SURFACE FEATURES

19. Pit Depth (cm) ______________________

20. Thickness of Vesicular Silt (cm) ______________________

21. Desert Pavement Development
(None, Poor, Moderate, Well) ______________________

22. Patina Development
(None, Moderate, Well) ______________________

COMMENTS

____

____

____

____

ROCK DESCRIPTIONS

23. Rock Type/Formation ______________________

24. Color, Grain size, Hardness, Texture ______________________

____

25. Degree of Weathering ______________________

26. Structure
Bedding Characteristics ______________________

Bedding Attitude ______________________

Fracture, Joint ______________________

27. Secondary Alteration/Mineralization ______________________

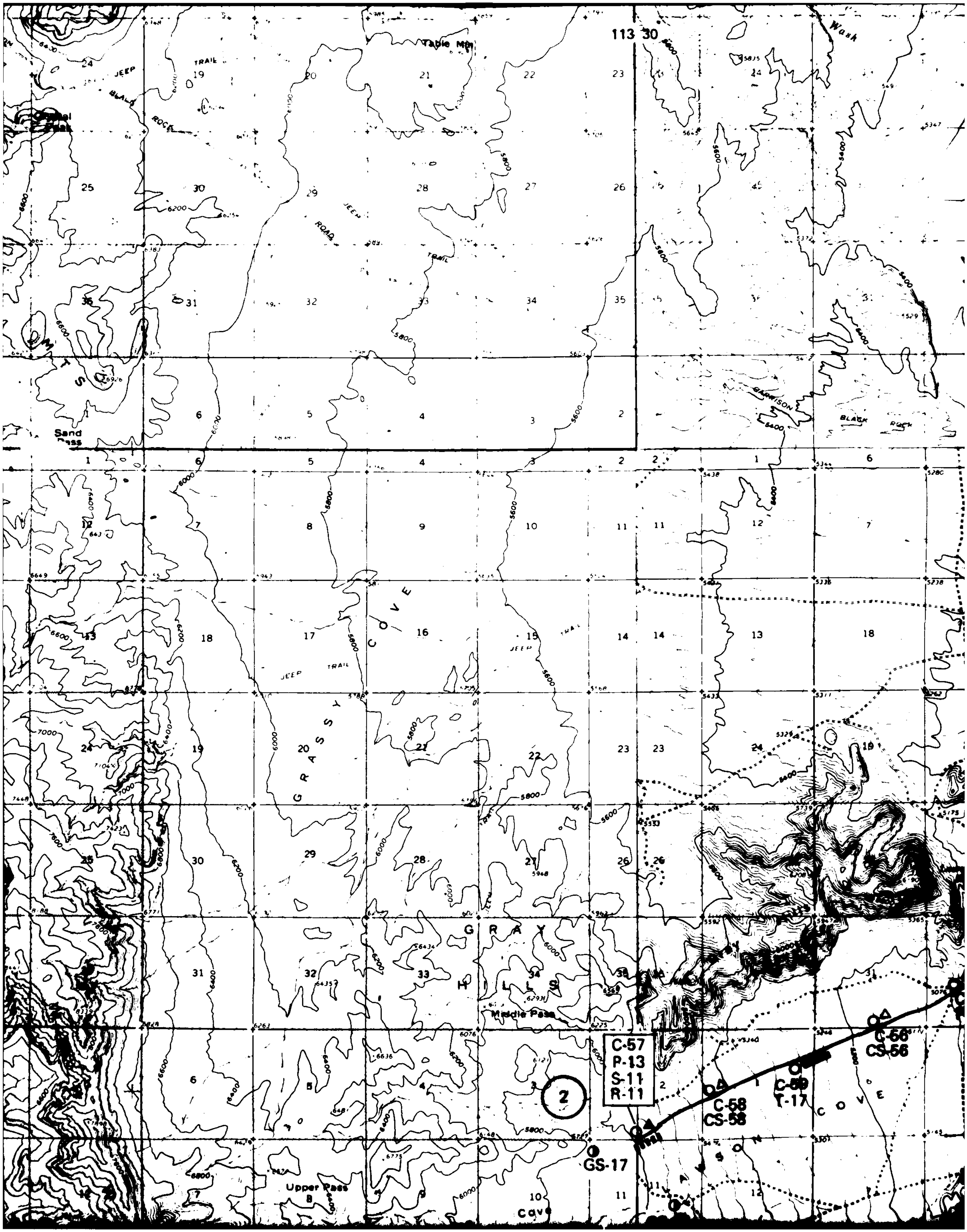
____

FIELD DATA SHEET
WAH WAH VALLEY, UTAH

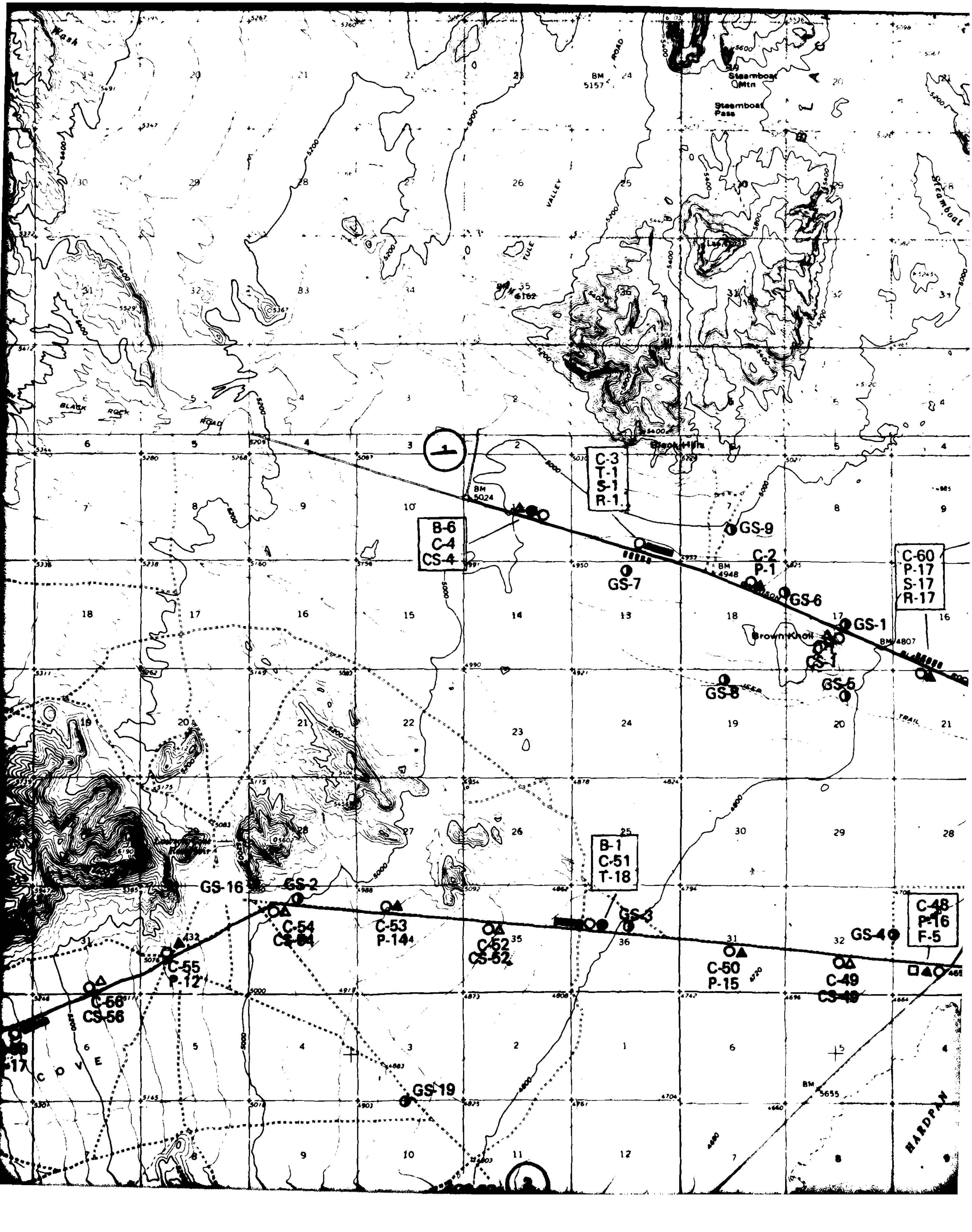
MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE — BMO

FIGURE II-1-1
2 OF 2

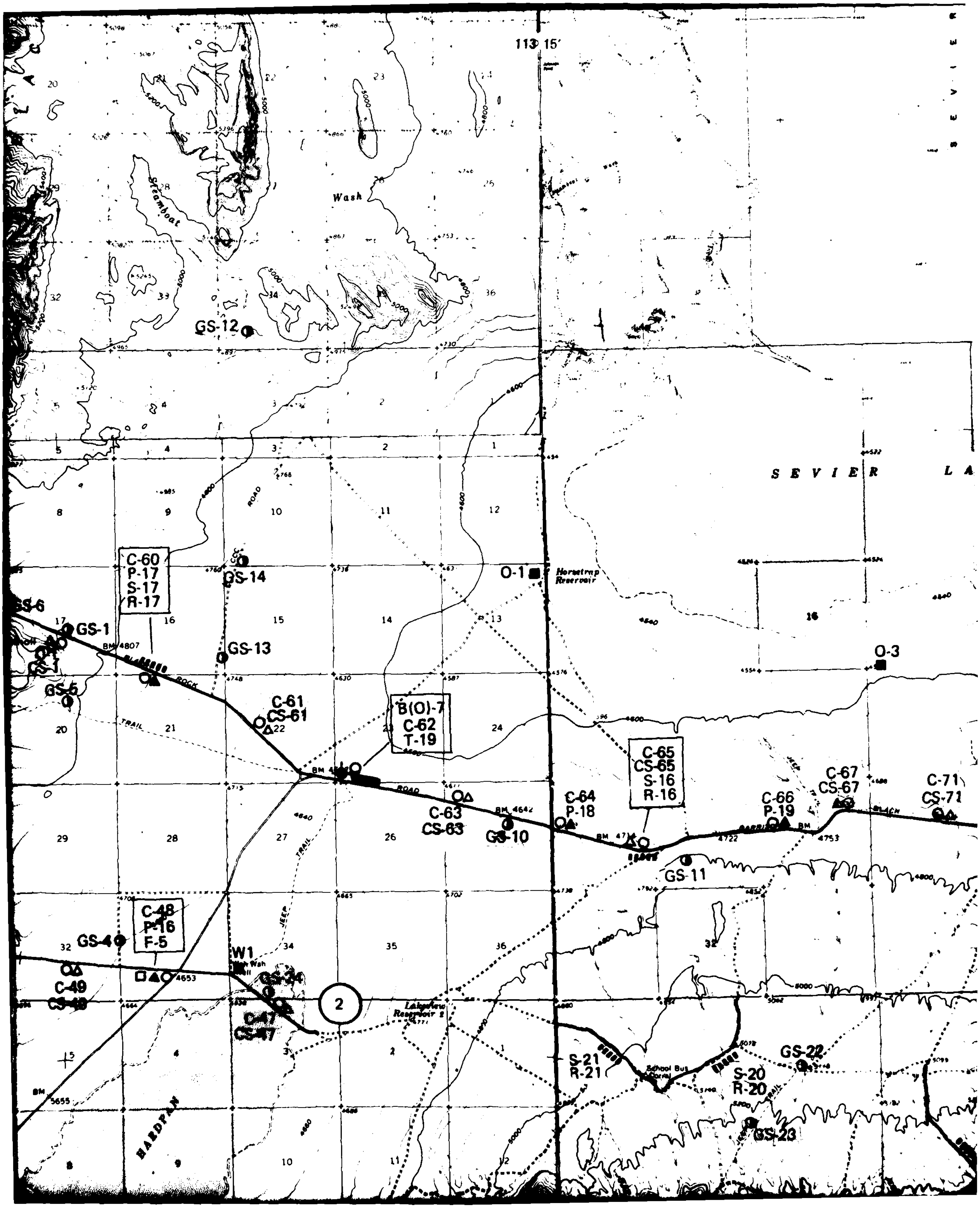
FUGRO NATIONAL, INC.

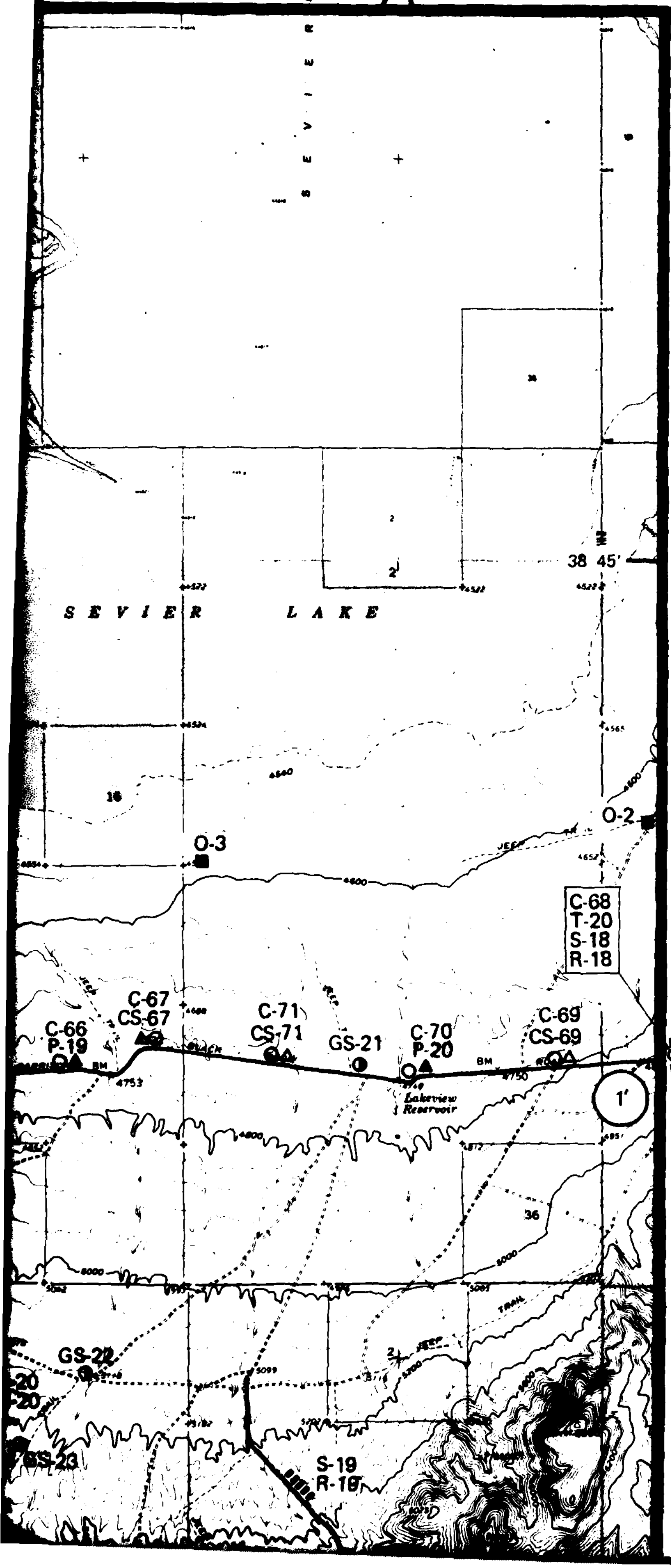


113 30
Table Mtn
Wash
JEEP TRAIL
BLACK ROCK
Sand Pass
JEEP ROAD
TRAIL
GARRISON
BLACK ROCK
GRASSY COVE
JEEP TRAIL
GRAY HILLS
Middle Pass
C-57
P-13
S-11
R-11
2
C-56
CS-56
C-59
T-17
C-58
CS-58
COVE
GS-17
Upper Pass
Cave

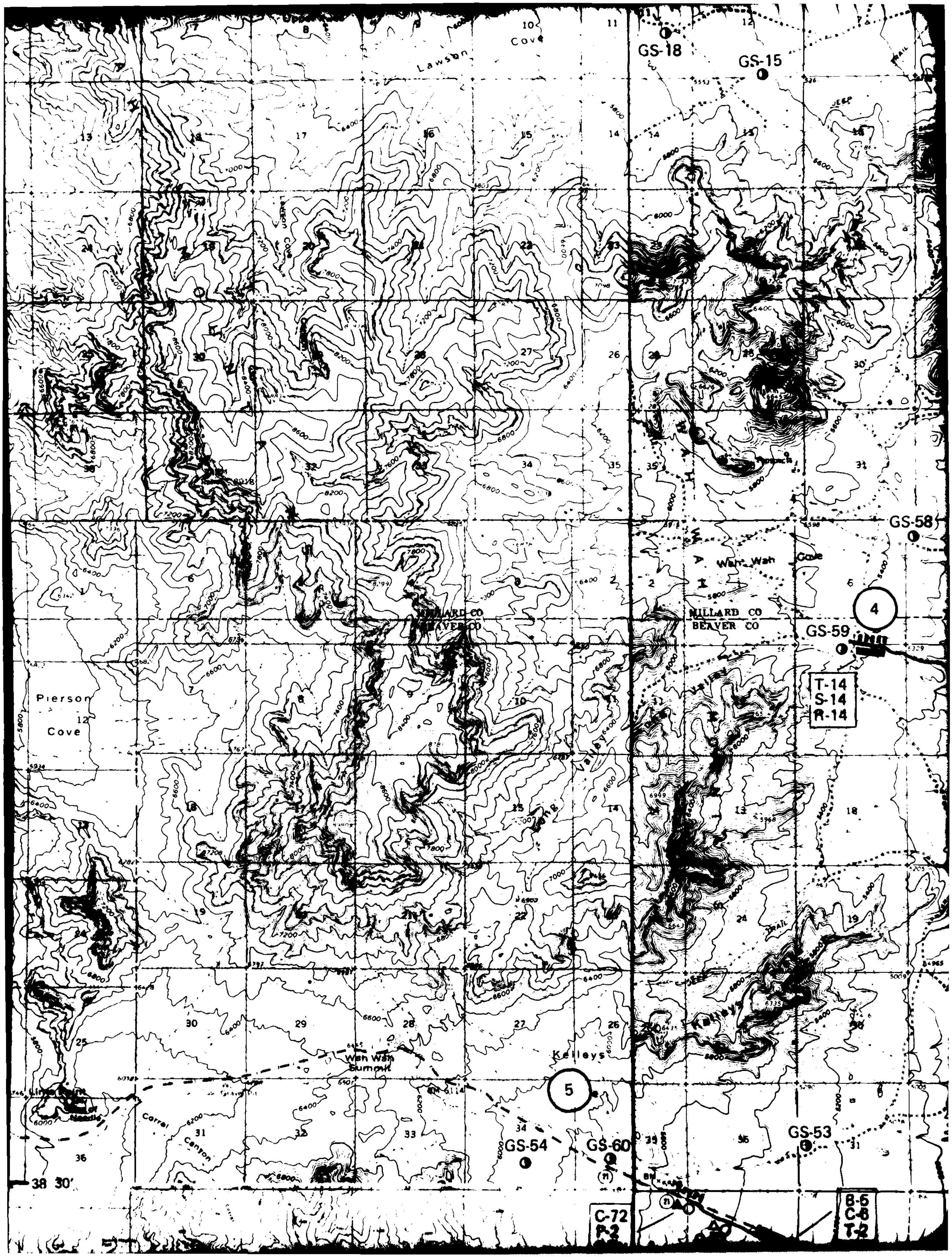


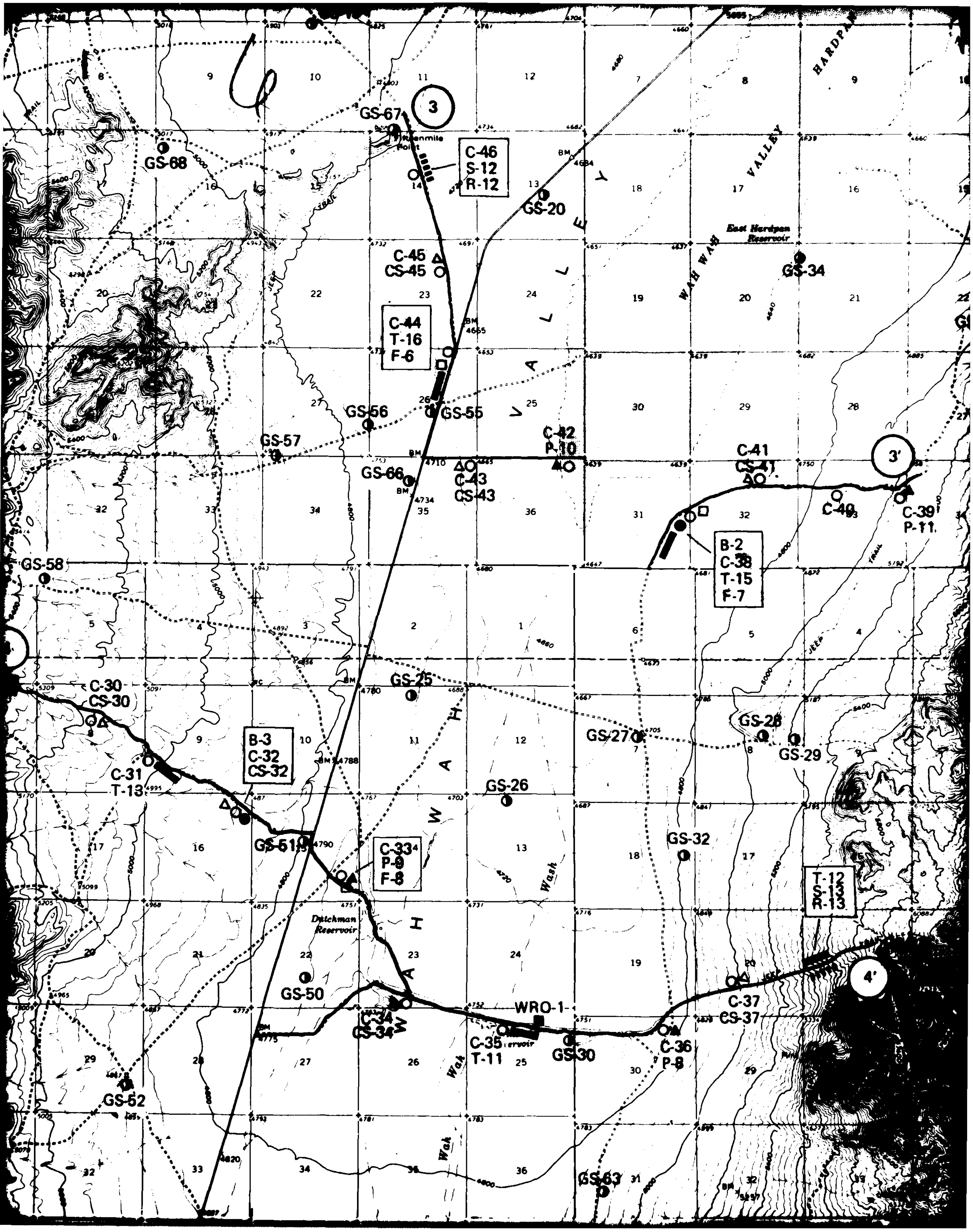
Steamboat Mtn
Steamboat Pass
Steamboat
BM 5157
ROAD
VALLEY
TULE
BLACK ROCK
ROAD
BM 5024
C-3
T-1
S-1
R-1
B-6
C-4
CS-4
GS-9
GS-7
BM 4948
C-2
P-1
GS-6
C-60
P-17
S-17
R-17
GS-1
Brown Knoll
BM 4807
GS-8
GS-5
TRAIL
B-1
C-51
T-18
GS-16
GS-2
C-54
C-53
P-14
C-52
CS-52
GS-3
C-50
P-15
C-49
GS-4
C-48
P-16
F-5
C-55
P-12
C-56
CS-56
COVE
GS-19
HARDPAN


113° 15'
Wash
Steamboat
SEVIER LA
GS-12
C-60
P-17
S-17
R-17
GS-14
O-1
Horsetrap Reservoir
GS-6
GS-1
BM 4807
GS-13
CS-1
GS-5
TRAIL
ROAD
C-61
CS-61
B(O)-7
C-62
T-19
O-3
C-65
CS-65
S-16
R-16
C-67
CS-67
C-71
CS-71
C-66
P-19
C-64
P-18
BM 4642
C-63
CS-63
GS-10
GS-11
C-48
P-16
F-5
GS-4
C-49
CS-49
W1
GS-34
C-47
CS-47
2
Lakeview Reservoir
S-21
R-21
School Bus Corral
S-20
R-20
GS-22
GS-23
HARDPAN
BM 5655

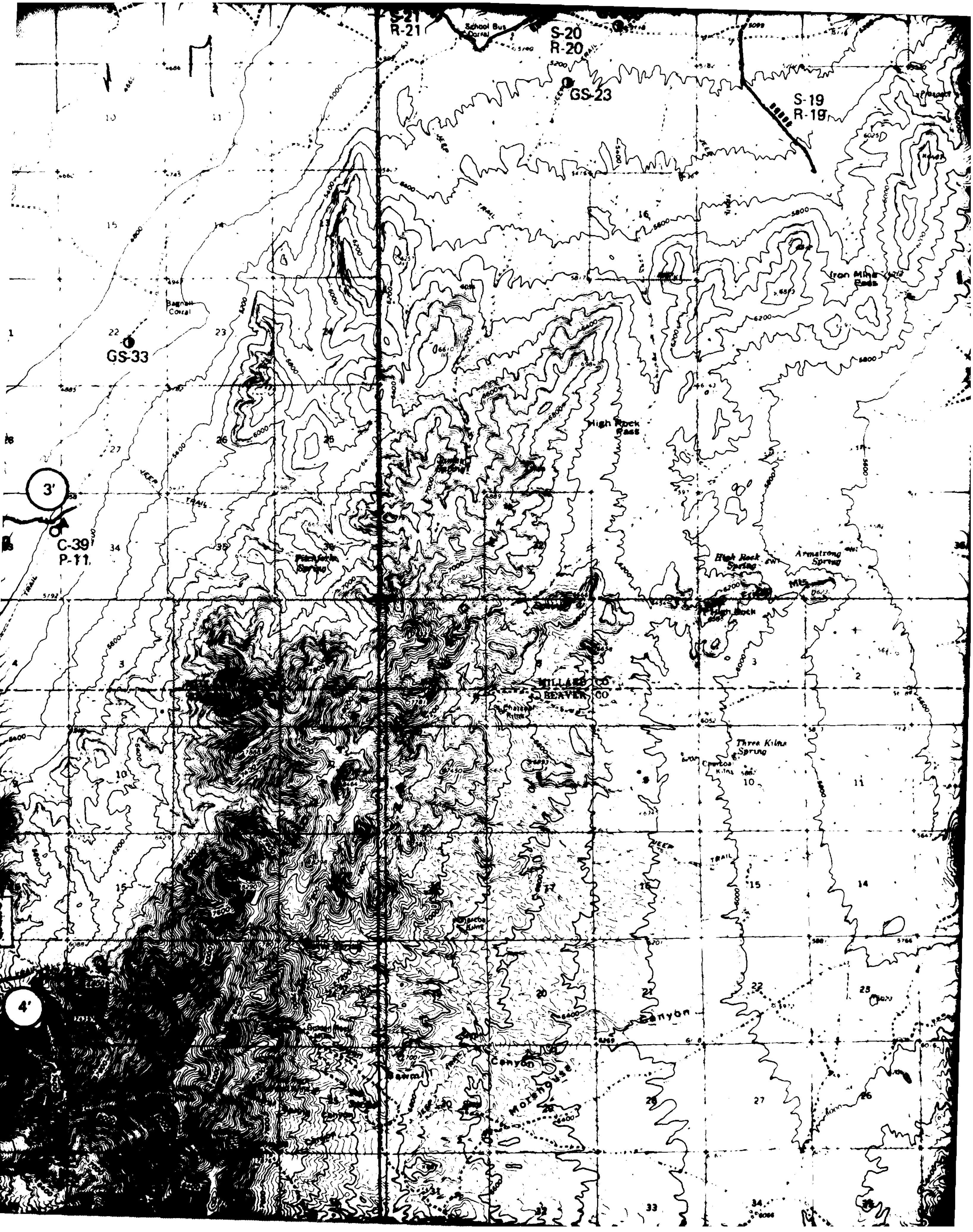


SEVIER
SEVIER LAKE
38 45'
O-3
O-2
C-68
T-20
S-18
R-18
C-66
P-19
C-67
CS-67
C-71
CS-71
GS-21
C-70
P-20
C-69
CS-69
Lakeview Reservoir
1'
36
16
GS-22
GS-23
S-19
R-19


Lawson
Cove
GS-18
GS-15
Wah Wah Cove
MILLARD CO
BEAVER CO
GS-58
4
GS-59
T-14
S-14
R-14
Pierson
Cove
Kelleys
5
Wah Wah
Summit
Corral
Canyon
GS-54
GS-60
GS-53
38 30'
C-72
P-2
B-6
C-6
T-2

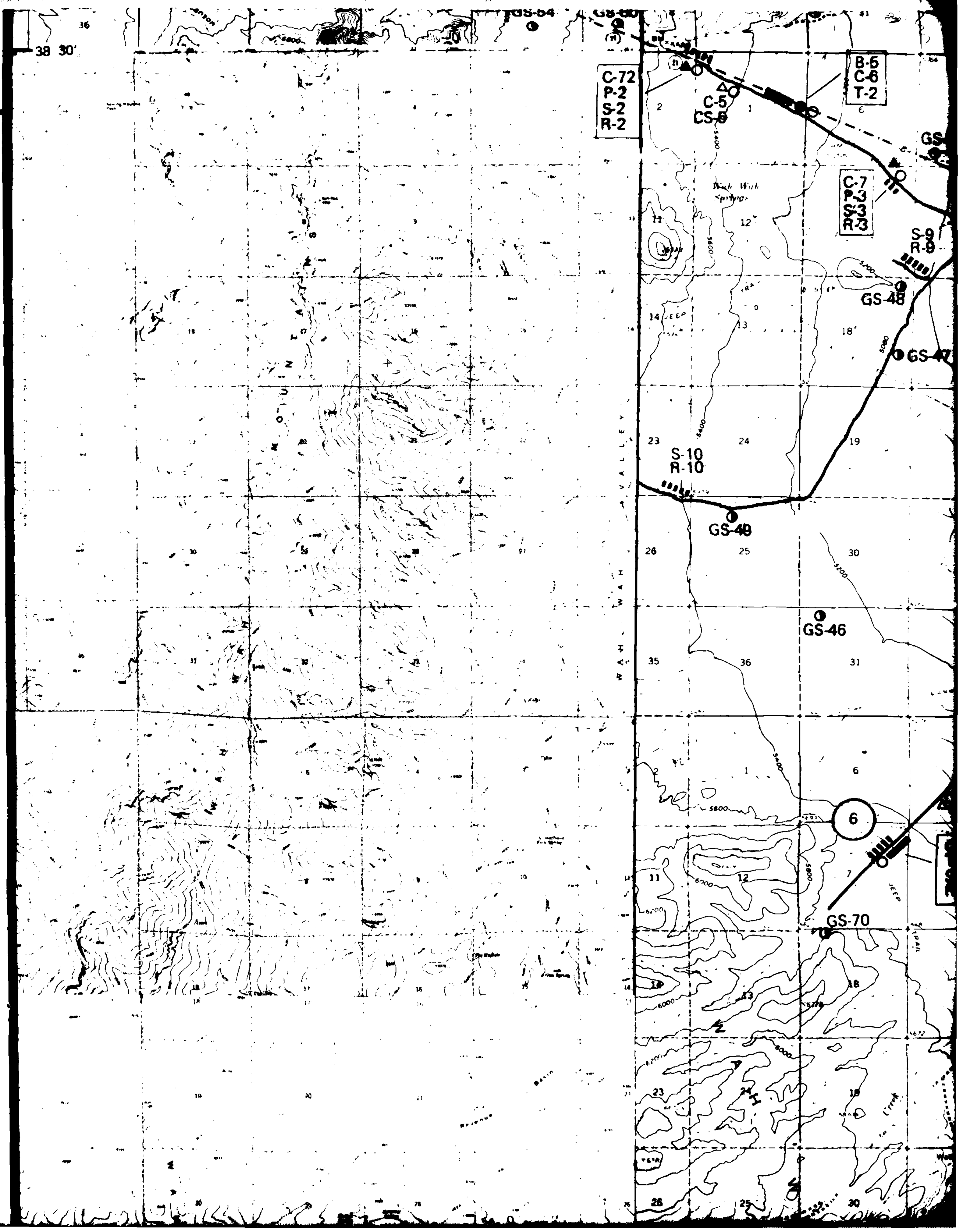


3
3'
4'
GS-67
Fifteenmile Point
C-46
S-12
R-12
GS-68
GS-20
WAH WAH VALLEY
HARDPAN
East Hardpan Reservoir
GS-34
C-45
CS-45
C-44
T-16
F-6
GS-56
GS-55
GS-57
C-42
P-10
C-41
CS-41
GS-66
C-43
CS-43
C-40
C-39
P-11
B-2
C-38
T-15
F-7
GS-58
TRAIL
JEEP
C-30
CS-30
GS-25
GS-28
GS-27
GS-29
B-3
C-32
CS-32
C-31
T-13
GS-26
GS-51
GS-32
C-33
P-9
F-8
T-12
S-13
R-13
Dutchman Reservoir
Wash
GS-50
C-34
CS-34
WRO-1
C-35
T-11
GS-30
C-36
P-8
C-37
CS-37
GS-52
GS-63

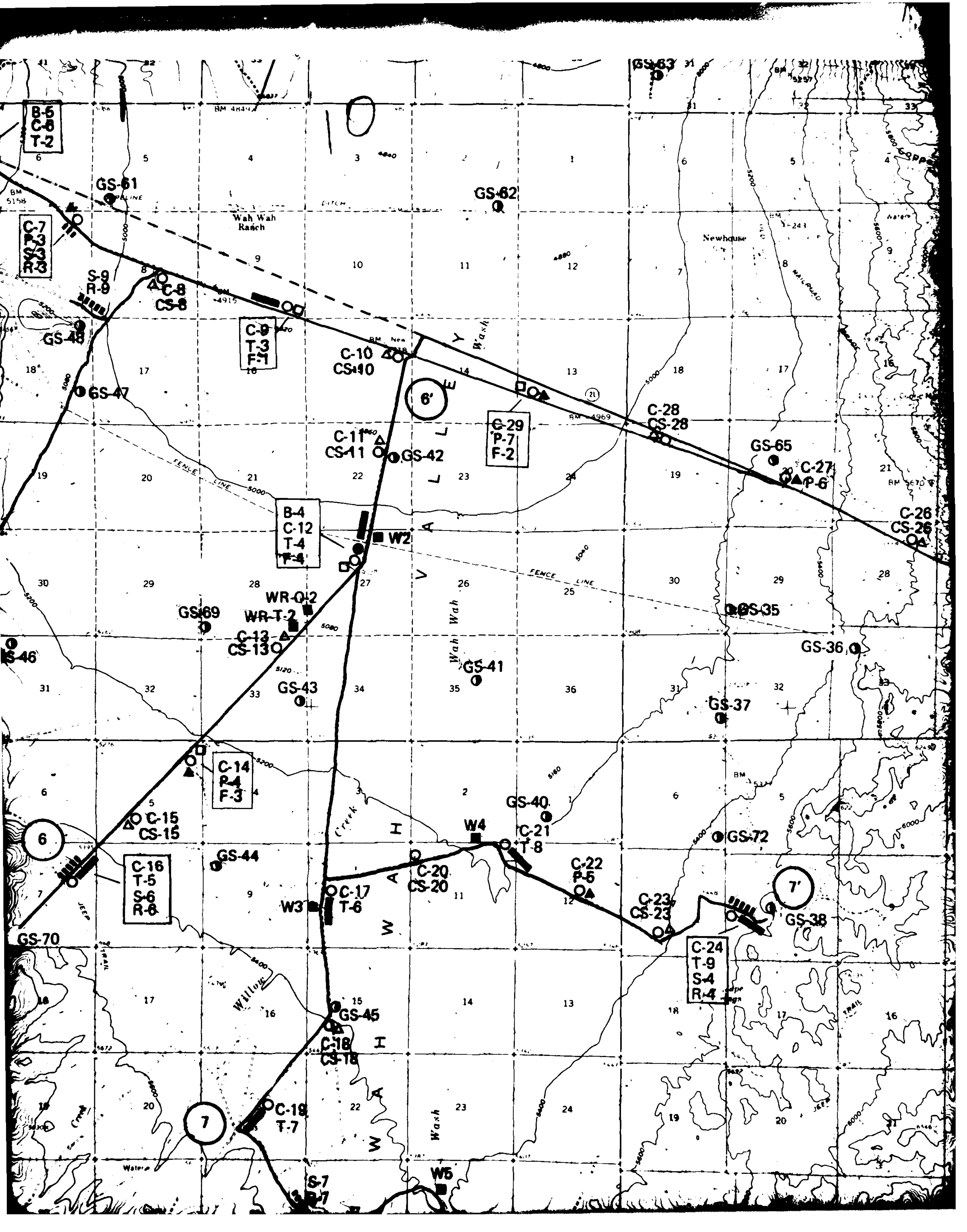


S-21
R-21
School Bus Corral
S-20
R-20
GS-23
S-19
R-19
Bagnell Corral
GS-33
High Rock Pass
Iron Mine Pass
3'
C-39
P-11
High Rock Spring
Armstrong Spring
MILLARD CO
BEAVER CO
Three Kilns Spring
Charcoal Kilns
4'
Canyon
Morehouse
JEEP
TRAIL

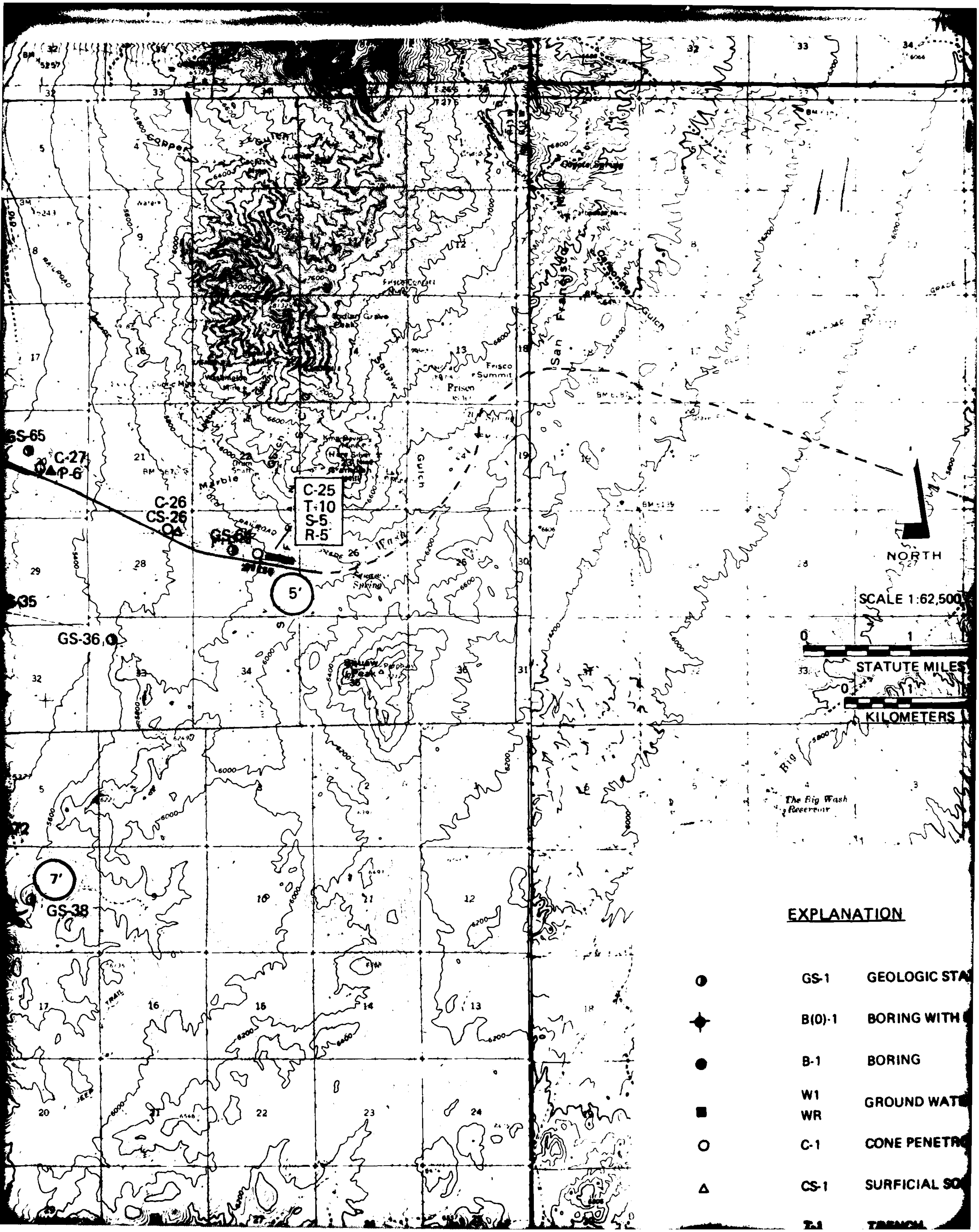
8



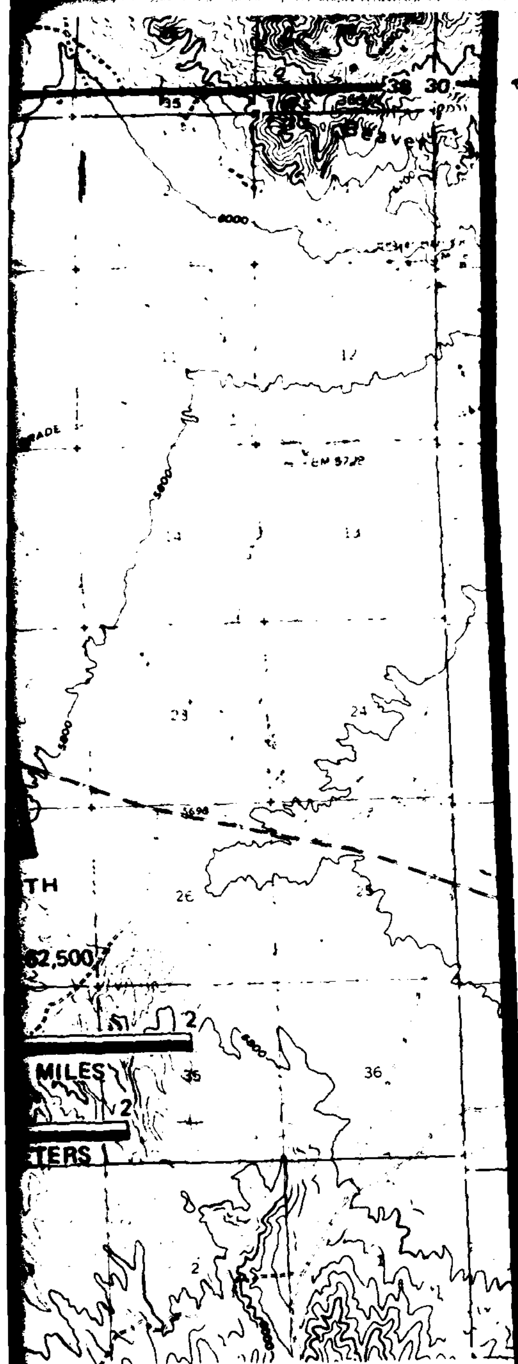
38 30'
GS-64
C-72
P-2
S-2
R-2
B-5
C-6
T-2
C-5
C-7
P-3
S-3
R-3
S-9
R-9
GS-48
GS-47
S-10
R-10
GS-49
GS-46
6
GS-70
WAH WAH VALLEY



B-5
C-8
T-2
GS-61
Wah Wah Ranch
GS-62
GS-63
Newhouse
C-7
P-3
S-3
R-3
S-9
R-9
C-8
CS-8
GS-48
C-9
T-3
F-1
C-10
CS-10
GS-47
6'
C-29
P-7
F-2
C-28
CS-28
GS-65
C-27
P-6
C-26
CS-26
C-11
CS-11
GS-42
B-4
C-12
T-4
F-4
W2
FENCE LINE
Wah Wah Valley
Wah Wah Wash
WR-O-2
WR-T-2
GS-69
C-13
CS-13
GS-35
GS-36
GS-46
GS-41
GS-43
GS-37
C-14
P-4
F-3
GS-40
C-15
CS-15
6
W4
C-21
T-8
GS-72
GS-44
C-20
CS-20
C-16
T-5
S-6
R-6
C-17
T-6
W3
C-22
P-5
7'
C-23
CS-23
GS-38
GS-70
C-24
T-9
S-4
R-4
Willow Creek
GS-45
C-18
CS-18
C-19
T-7
7
Wash
S-7
R-7
W5



GS-65
C-27
P-6
C-26
CS-26
GS-64
C-25
T-10
S-5
R-5
5′
GS-35
GS-36
7′
GS-38
Marble
Wash
Gulch
San Francisco
Frisco Summit
Prison
Copper Gulch
RAILROAD
The Big Wash Reservoir
Big Wash
NORTH
SCALE 1:62,500
0
1
STATUTE MILES
0
1
KILOMETERS
EXPLANATION
GS-1 GEOLOGIC STA
B(0)-1 BORING WITH
B-1 BORING
W1 WR GROUND WATE
C-1 CONE PENETR
CS-1 SURFICIAL SO



12

GIC STATION

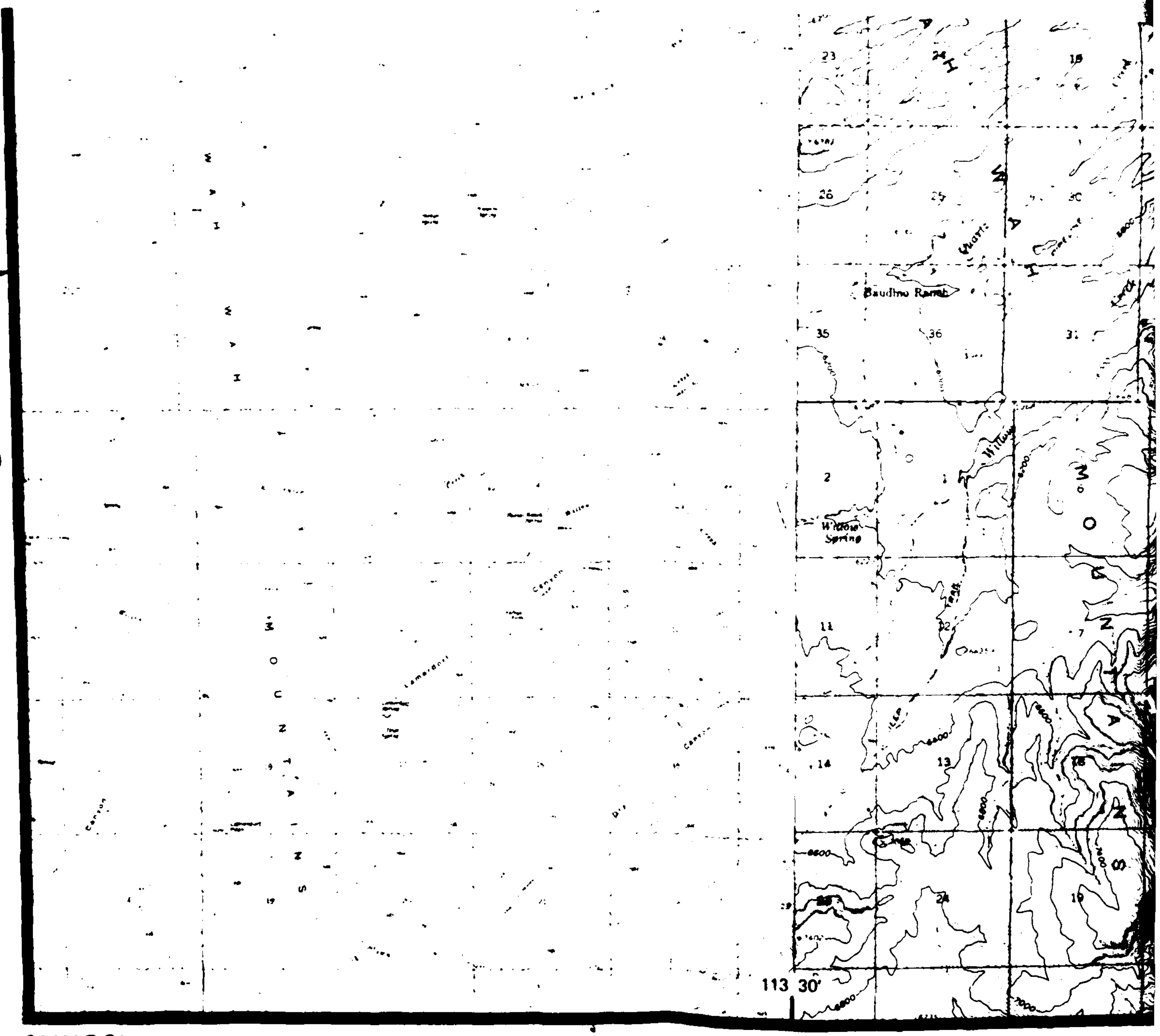
G WITH OBSERVATION WELL

G

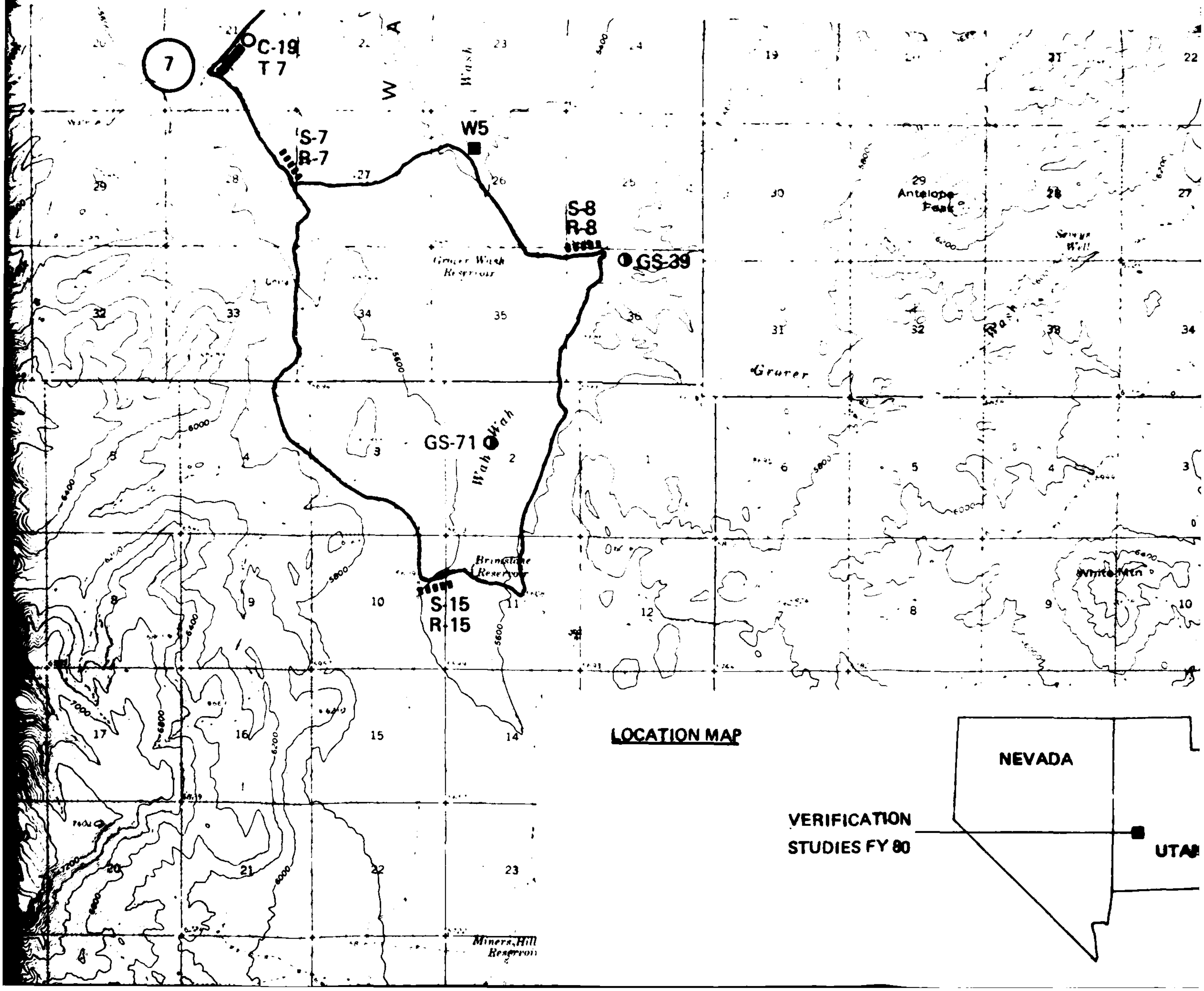
ND WATER LEVEL MEASUREMENT WELL

PENETROMETER TEST

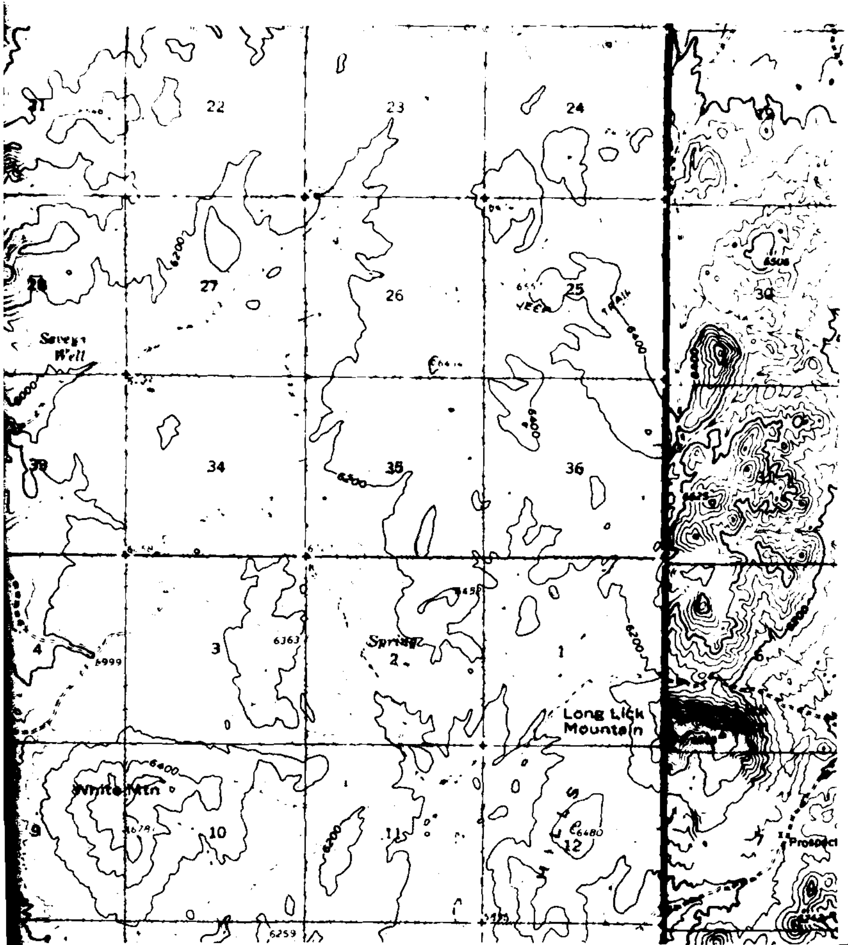
CIAL SOIL SAMPLE



24 MAR 81

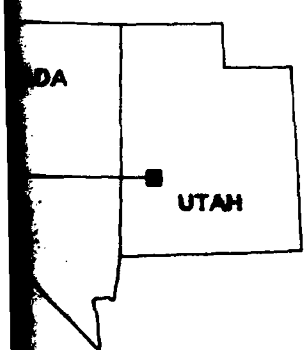


7
C-19
T 7
W5
S-7
R-7
S-8
R-8
GS-39
GS-71
S-15
R-15
Antelope Peak
Brimstone Reservoir
White Mtn
Miners Hill Reservoir
LOCATION MAP
NEVADA
VERIFICATION
STUDIES FY 80



Symbol	Code	Activity
●	B-1	BORING
■	W1 WR	GROUND WATER LEVEL MEASU
○	C-1	CONE PENETROMETER TEST
△	CS-1	SURFICIAL SOIL SAMPLE
▬	T-1	TRENCH
▲	P-1	TEST PIT
▪▪▪▪	S-1 R-1	SEISMIC REFRACTION LINE ELECTRICAL RESISTIVITY LINE
(1)—(1')		ACTIVITY LINE

NOTE: Due to the exaggeration of the map symbols, the exact location of any combination of activities is where either the boring (1st) or the CPT (2 is situated. Single activities are most securely located nearest the cent the symbol.



ACTIVITY LOCATION MA
WAH WAH VALLEY,UTA

MX SITING INVESTIGATION

DEPARTMENT OF THE AIR FORCE – BMO

FUGRO NATIONAL, I

45

BORING

GROUND WATER LEVEL MEASUREMENT WELL

CONE PENETROMETER TEST

SURFICIAL SOIL SAMPLE

TRENCH

TEST PIT

SEISMIC REFRACTION LINE
ELECTRICAL RESISTIVITY LINE

ACTIVITY LINE

...on of the map symbols, the exact location of any ...ies is where either the boring (1st) or the CPT (2nd) ...ivities are most securely located nearest the center of

...Y LOCATION MAP
...AH VALLEY, UTAH

...INVESTIGATION
...THE AIR FORCE – BMO

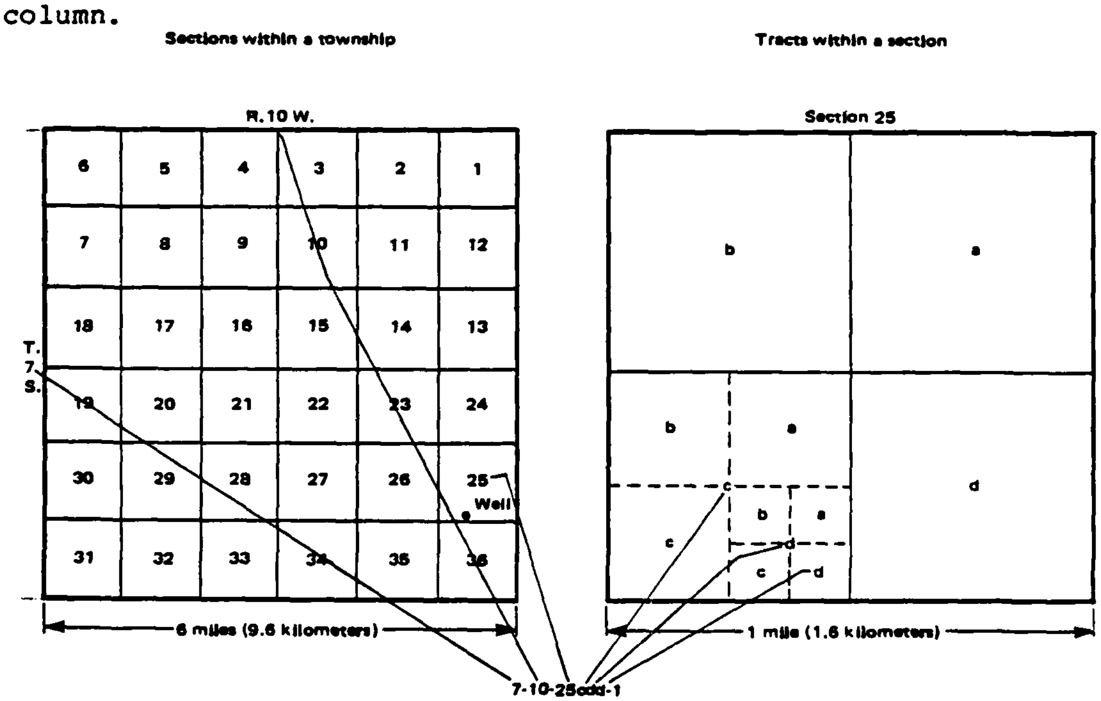
DRAWING
II-1-1

...NATIONAL, INC.

2.0 GROUND-WATER DATA

Explanation:

Existing ground-water data in Wah Wah Valley were collected from all available sources. These data were updated where possible from measurements taken during Fugro field operations, and all data are shown in Table II-2-1. Locations of water wells in which water-level measurements were available are shown in Drawing II-1-1. Well numbers listed in the left hand column of Table II-2-1 refer to well locations shown on Drawing II-1-1. Actual well numbers giving location, according to the Bureau of Land Management Land Survey System, are shown in the second column.



Water levels generally refer to the static ground-water table in the unconfined basin-fill aquifer. Perched conditions or levels in artesian aquifers are noted where known.

WELL NO.	WELL LOCATION NUMBER* (Twp-Rge-Sec)	ELEVATION OF GROUND SURFACE FEET (METERS) ABOVE M.S.L.	DEPTH OF WELL FEET (METERS)	WATER LEVEL			REFERENCES**/ REMARKS
				DEPTH BELOW GROUND SURFACE-FEET (METERS)	DATE MEASURED	ELEVATION - FEET (METERS) ABOVE M.S.L.	
W-1	24-13-34ccb	4645 (1416)	294 (90)	212 (65)	1972	4433 (1351)	1, 5
W-2	27-14-27aba	5020 (1530)	500 (152)	dry	9-51	< 4520 (1378)	1, 2
W-3	28-14-10cca	5334 (1626)	1117 (450)	800 (244)	6-75	4534 (1382)	2
W-4	28-14-11abb	5190 (1582)	1475 (450)	670 (204)	3-74	4520 (1378)	1, 2
W-5	28-14-26bd	5390 (1643)	757 (231)	535 (163)	5-74	4855 (1480)	2
O-1	24-13-13aa	4550 (1387)	150 (46)	94 (29)	7-80	4456 (1358)	3
O-2	24-11-18ca	4640 (1414)	150 (46)	139 (42)	11-80	4501 (1372)	3
O-3	24-12-15cc	4580 (1396)	150 (46)	145 (44)	11-80	4435 (1352)	3
B(O)-7	24-13-23cc	4620 (1408)	201 (61)	178 (54)	10-80	4442 (1354)	3
WRO-1	26-14-25ab	4760 (1451)	1135 (345)	dry	1-81	< 3625 (1105)	4
WRT-2	27-14-28dd1	5080 (1548)	1350 (412)	no data available	—	—	4
WRO-2	27-14-28dd2	5080 (1548)	1399 (426)	no data available	—	—	4

* SALT LAKE BASELINE AND MERIDIAN; ALL TOWNSHIPS ARE SOUTH, ALL RANGES ARE WEST

** 1. STEPHENS, J.C., 1974, HYDROLOGIC RECONNAISSANCE OF WAH WAH VALLEY, TECHNICAL PUBLICATION NO. 47, STATE OF UTAH, DEPT. OF NATURAL RESOURCES
2. UTAH STATE ENGINEERS OFFICE, DRILL LOGS
3. FNI VERIFICATION STUDIES, FY 80
4. FNI WATER RESOURCES INTERMEDIATE AQUIFER DRILLING PROGRAM
5. USGS COMPUTER PRINT-OUT OF UTAH WATER WELLS, 1974

GROUND-WATER DATA
WAH WAH VALLEY, UTAH

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE – BMO

TABLE II-2-1

FUGRO NATIONAL, INC.

3.0 SEISMIC REFRACTION DATA

Explanation: Each figure shows seismic wave travel times plotted versus surface distance between the energy source (shot) and the detector (geophone) for a single seismic line. Distances are measured along the line from geophone number 1 which is designated as zero distance. Distances to the right (on the paper) of geophone 1 are positive. The direction arrow gives the approximate direction along the geophone array from geophone 1 to geophone 24.

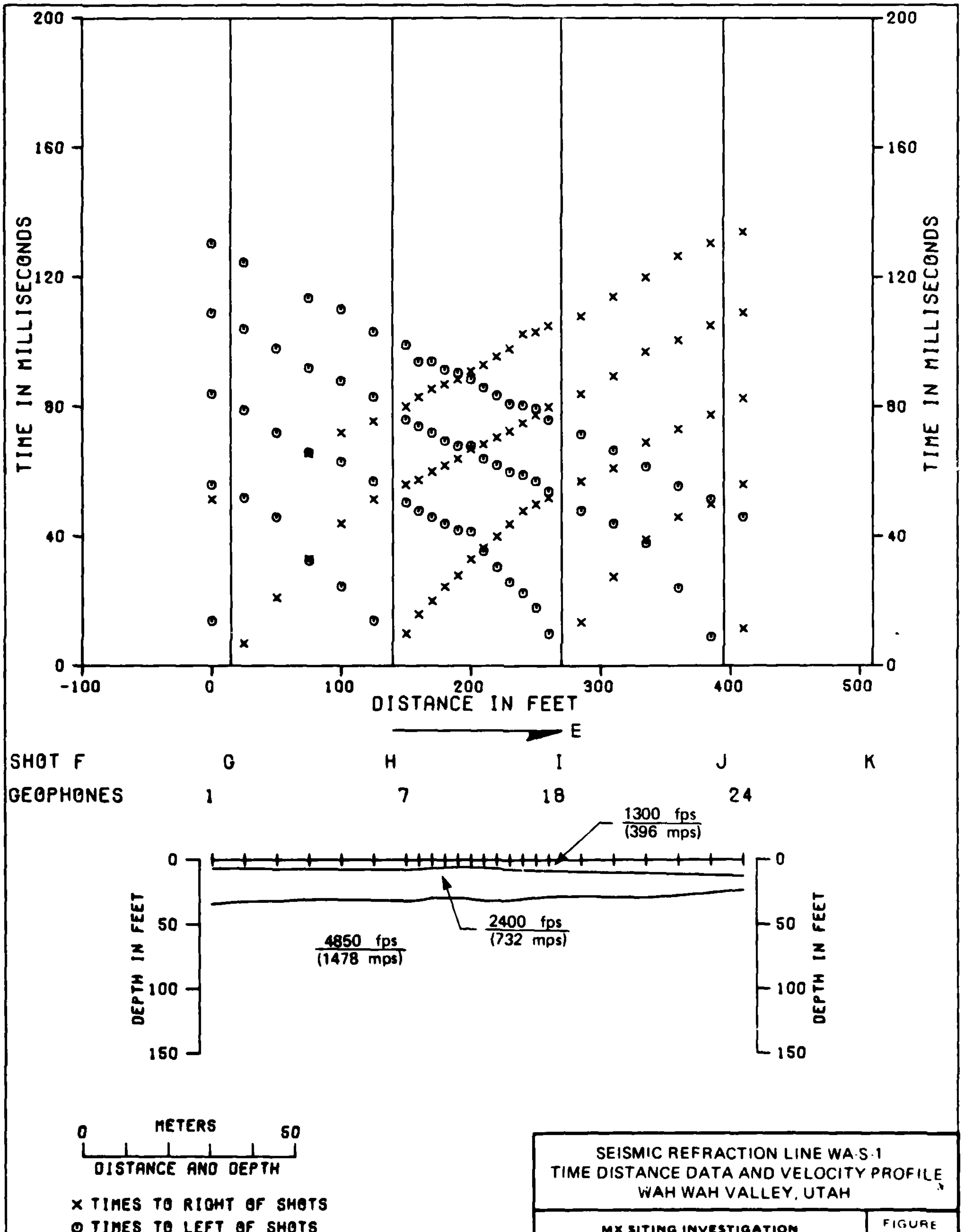
Travel Time Versus Distance Graph (Upper Half of Figure)

This is a travel time versus distance graph. The abscissa represents distance; the ordinate, time. The six vertical lines represent the locations of shots (designated as F, G, H, I, J, and K). The symbol, X, denotes travel times at geophones that were located to the right of a shot. The symbol, ⊙, denotes travel times that were located to the left of shots.

Velocity Cross Section (Lower Half of Figure)

This is an interpreted velocity cross section beneath the seismic line. The top line represents the ground-surface profile. The short vertical lines crossing the top line mark the geophone positions. The depth scale is plotted relative to a point on the line which was arbitrarily chosen as "zero elevation" at the time the line was surveyed. The additional lines across the cross section represent the interpreted boundaries between layers of material with different compressional wave

velocities. These boundaries are commonly called "refractors". The velocity interpreted to be representative of each layer is shown.



SEISMIC REFRACTION LINE WA-S-1
TIME DISTANCE DATA AND VELOCITY PROFILE
WAH WAH VALLEY, UTAH

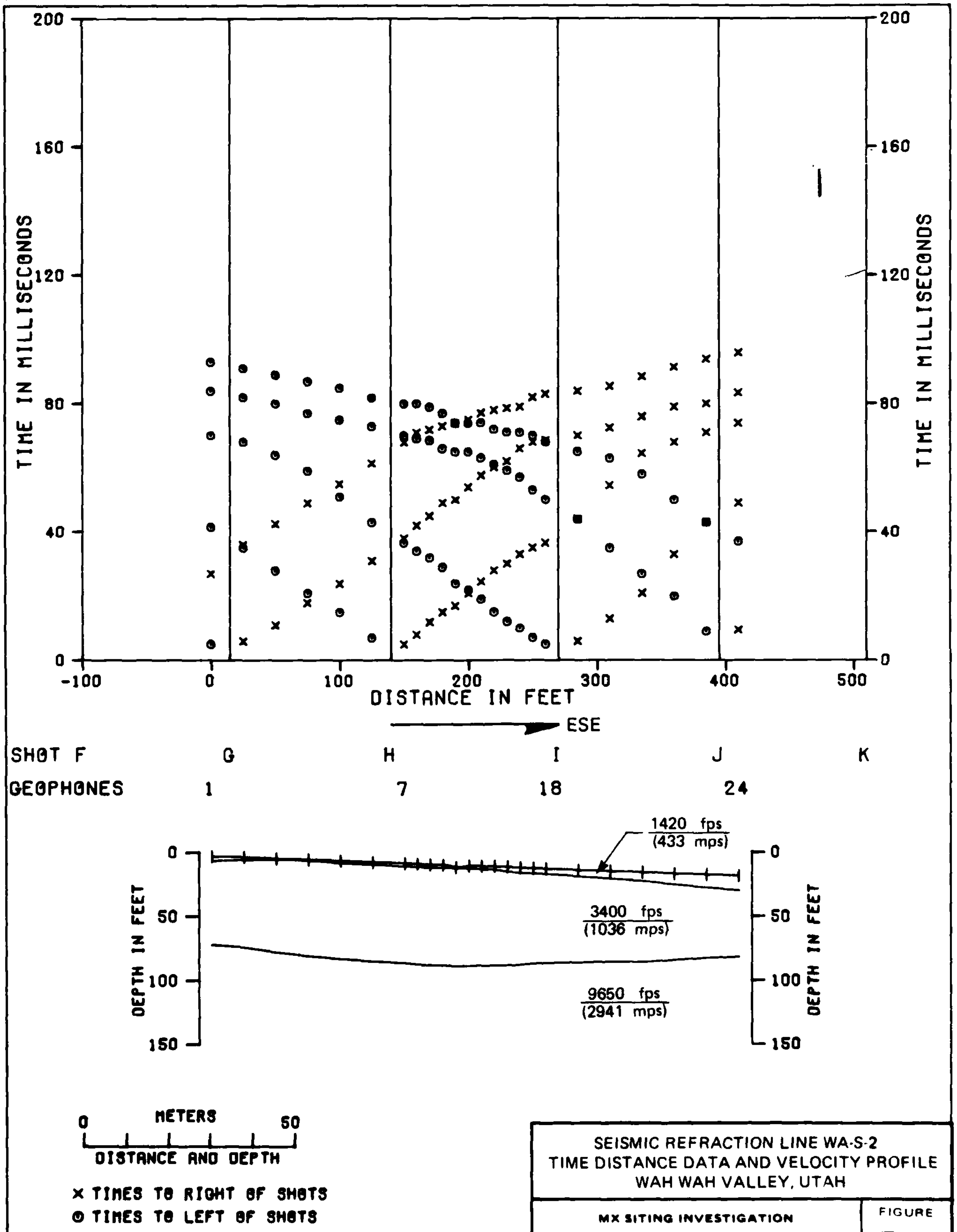
MX SITING INVESTIGATION

DEPARTMENT OF THE AIR FORCE – BMO

FIGURE II-3-1

FUGRO NATIONAL, INC.

FN-TR-27-WA-II



SEISMIC REFRACTION LINE WA-S-2
TIME DISTANCE DATA AND VELOCITY PROFILE
WAH WAH VALLEY, UTAH

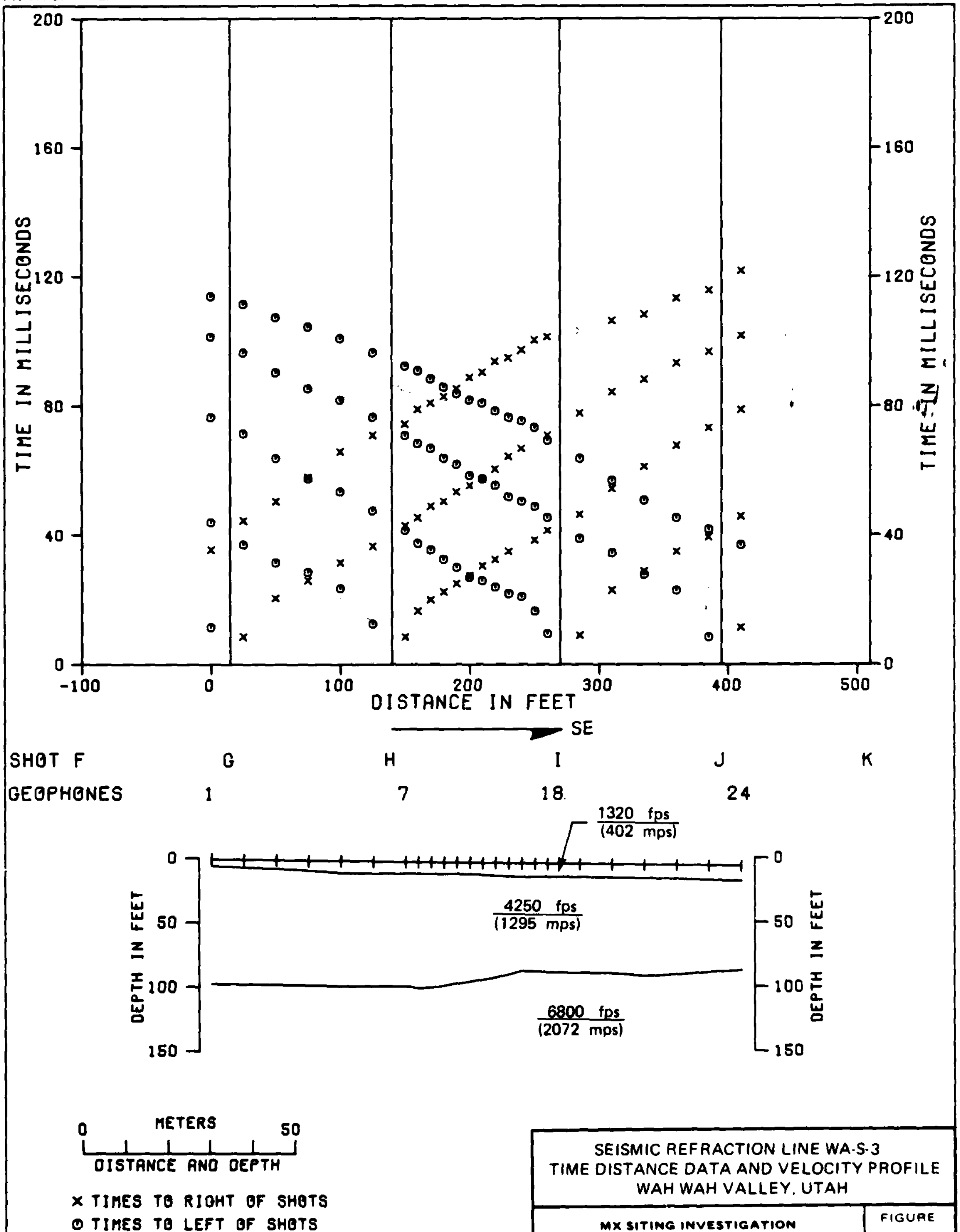
MX SITING INVESTIGATION

DEPARTMENT OF THE AIR FORCE – BMO

FIGURE II-3-2

FUGRO NATIONAL, INC.

24 MAR 81



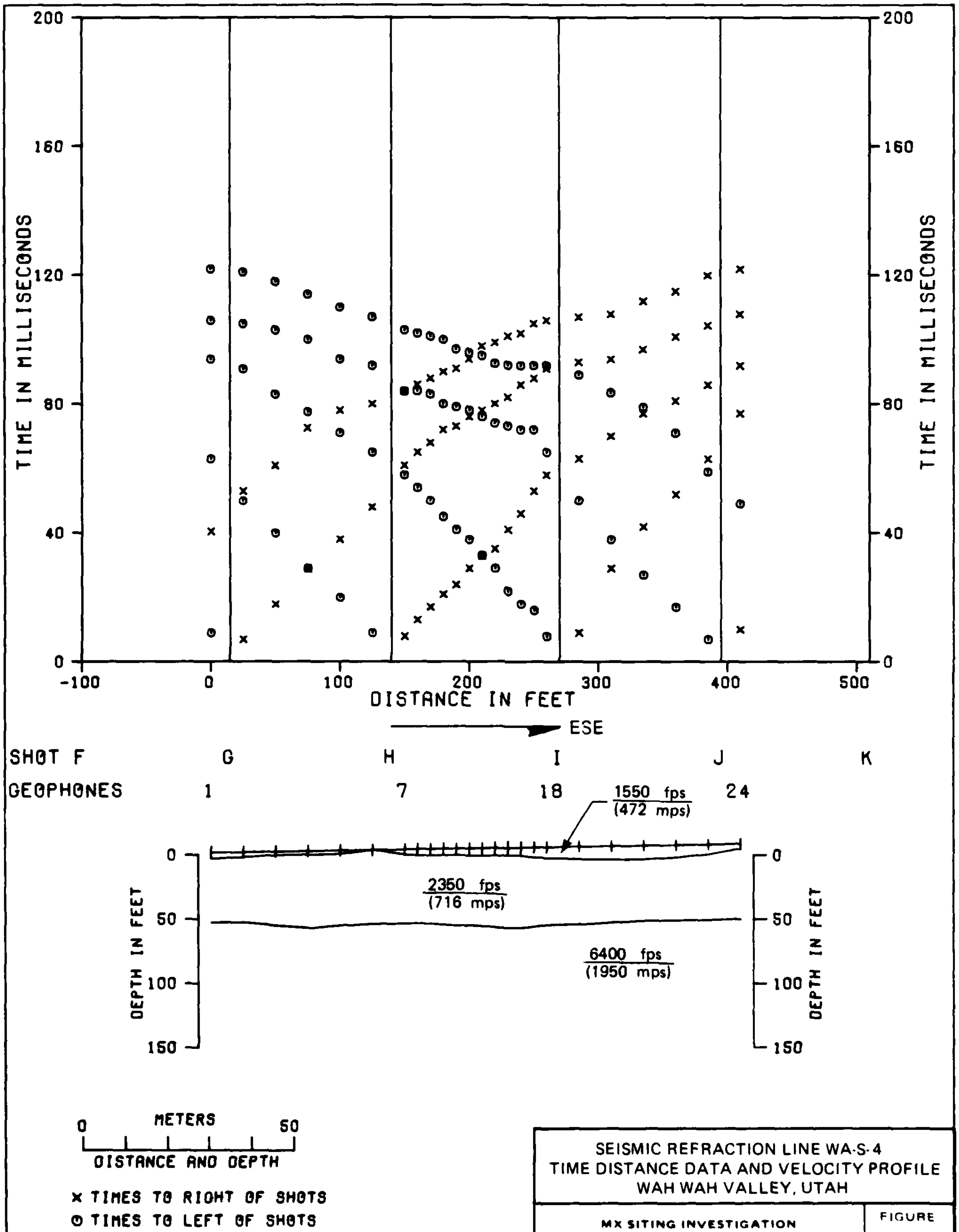
SEISMIC REFRACTION LINE WA-S-3
TIME DISTANCE DATA AND VELOCITY PROFILE
WAH WAH VALLEY, UTAH

MX SITING INVESTIGATION

DEPARTMENT OF THE AIR FORCE – BMO

FIGURE II-3-3

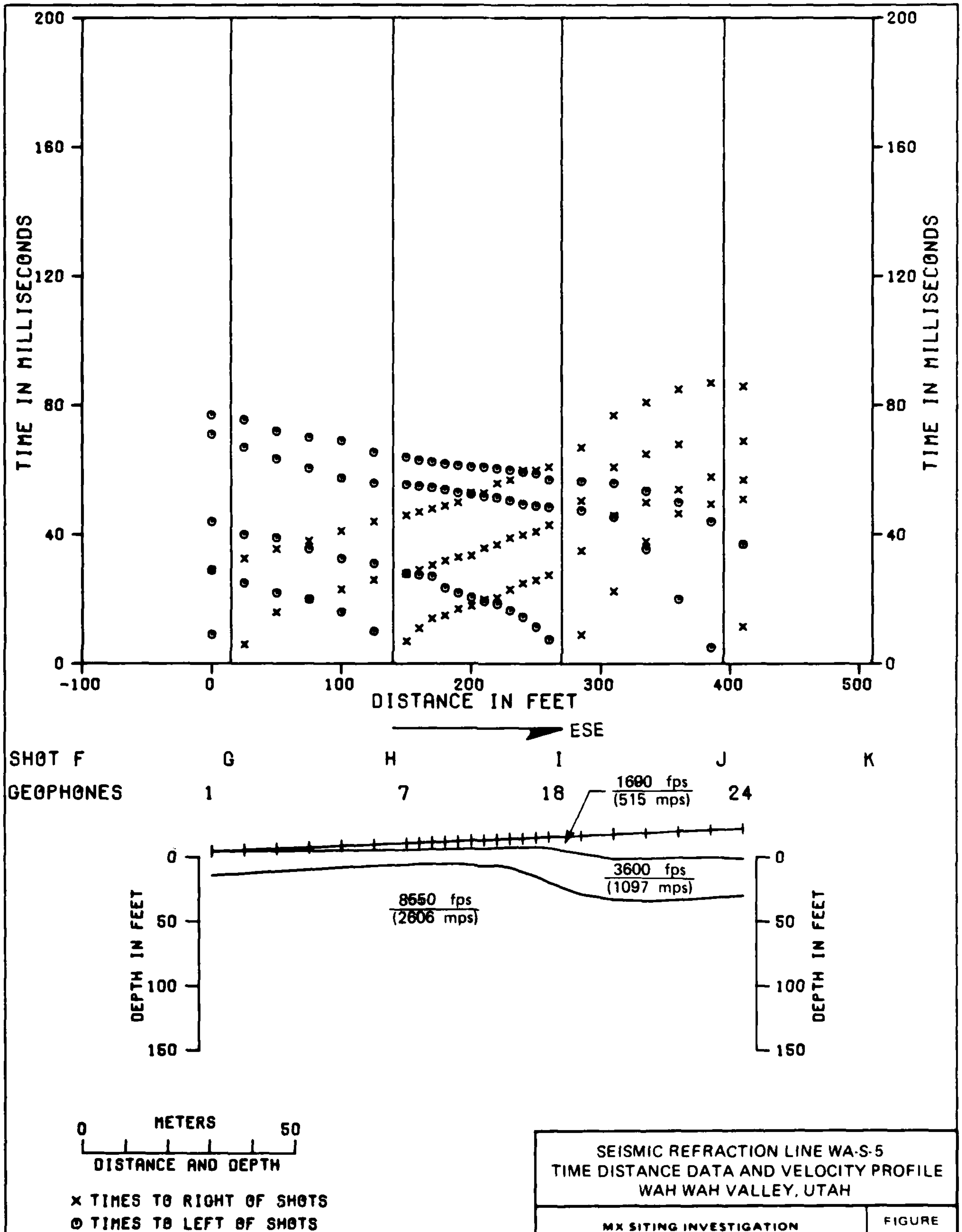
FUGRO NATIONAL, INC.



SEISMIC REFRACTION LINE WA-S-4
TIME DISTANCE DATA AND VELOCITY PROFILE
WAH WAH VALLEY, UTAH

MX SITING INVESTIGATION DEPARTMENT OF THE AIR FORCE — BMO	FIGURE II-3-4

FUGRO NATIONAL, INC.



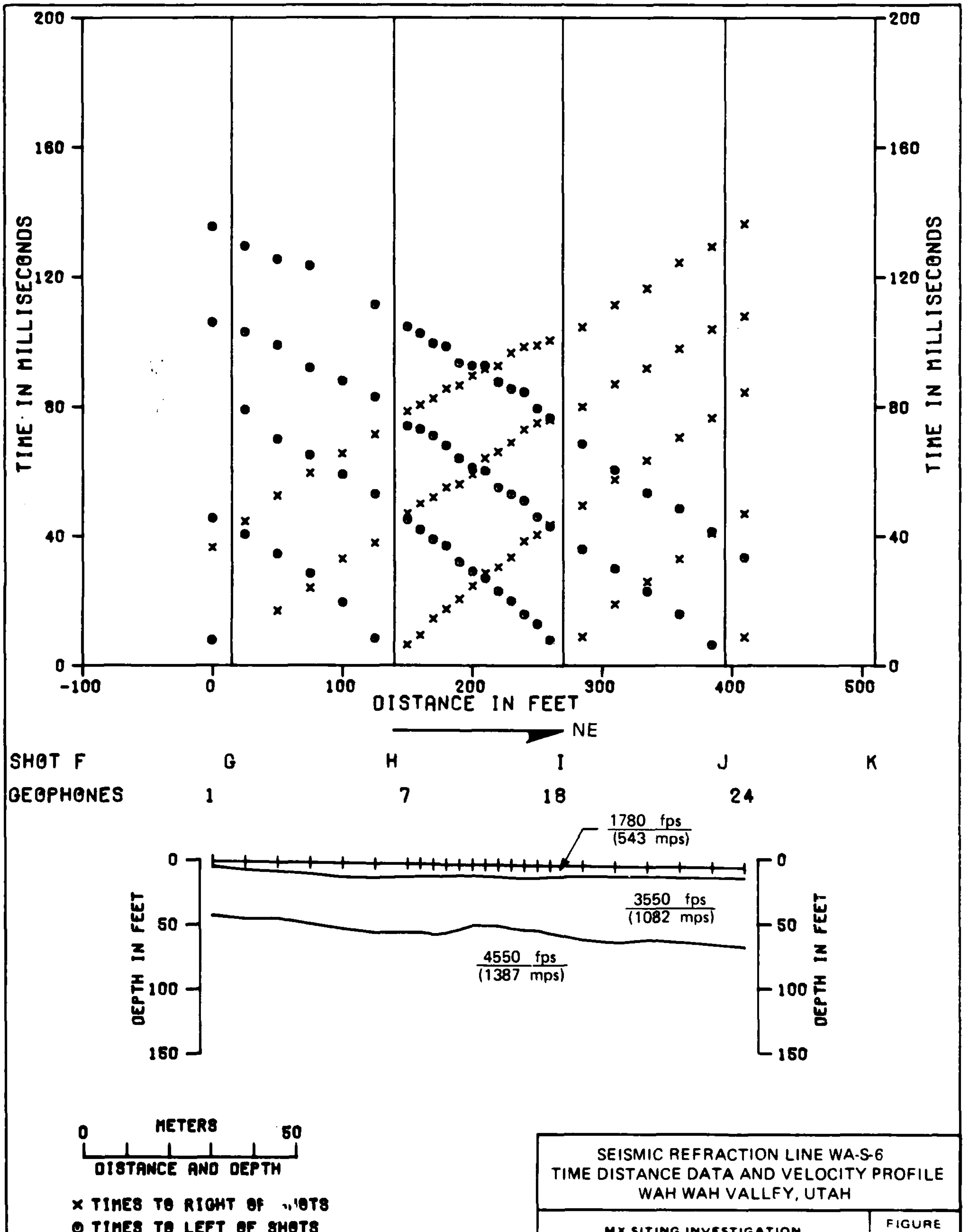
SEISMIC REFRACTION LINE WA-S-5
TIME DISTANCE DATA AND VELOCITY PROFILE
WAH WAH VALLEY, UTAH

MX SITING INVESTIGATION

DEPARTMENT OF THE AIR FORCE – BMO

FIGURE II-3-5

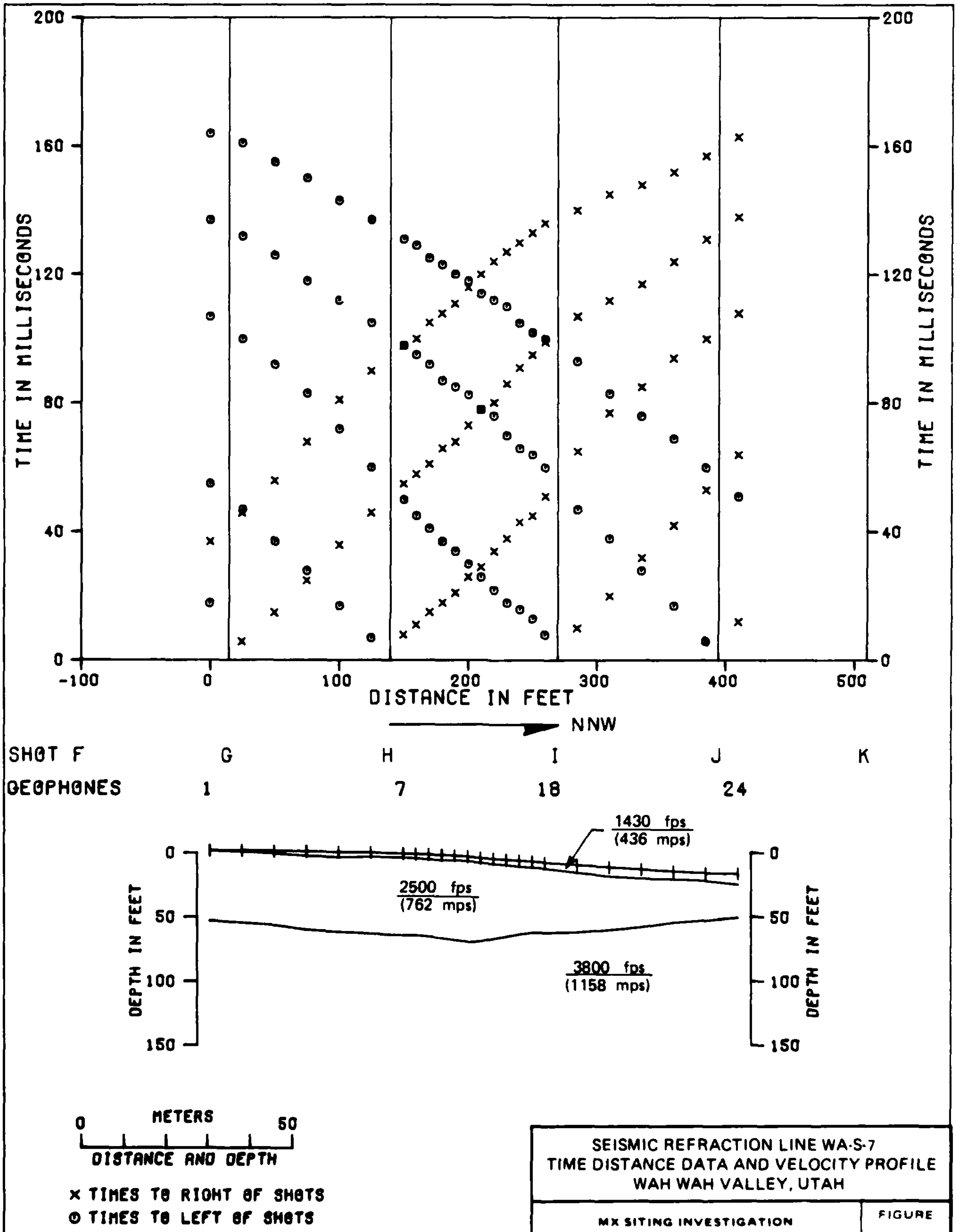
FUGRO NATIONAL, INC.



SEISMIC REFRACTION LINE WA-S-6
TIME DISTANCE DATA AND VELOCITY PROFILE
WAH WAH VALLEY, UTAH

MX SITING INVESTIGATION DEPARTMENT OF THE AIR FORCE – BMO	FIGURE II-3-6

FUGRO NATIONAL, INC.



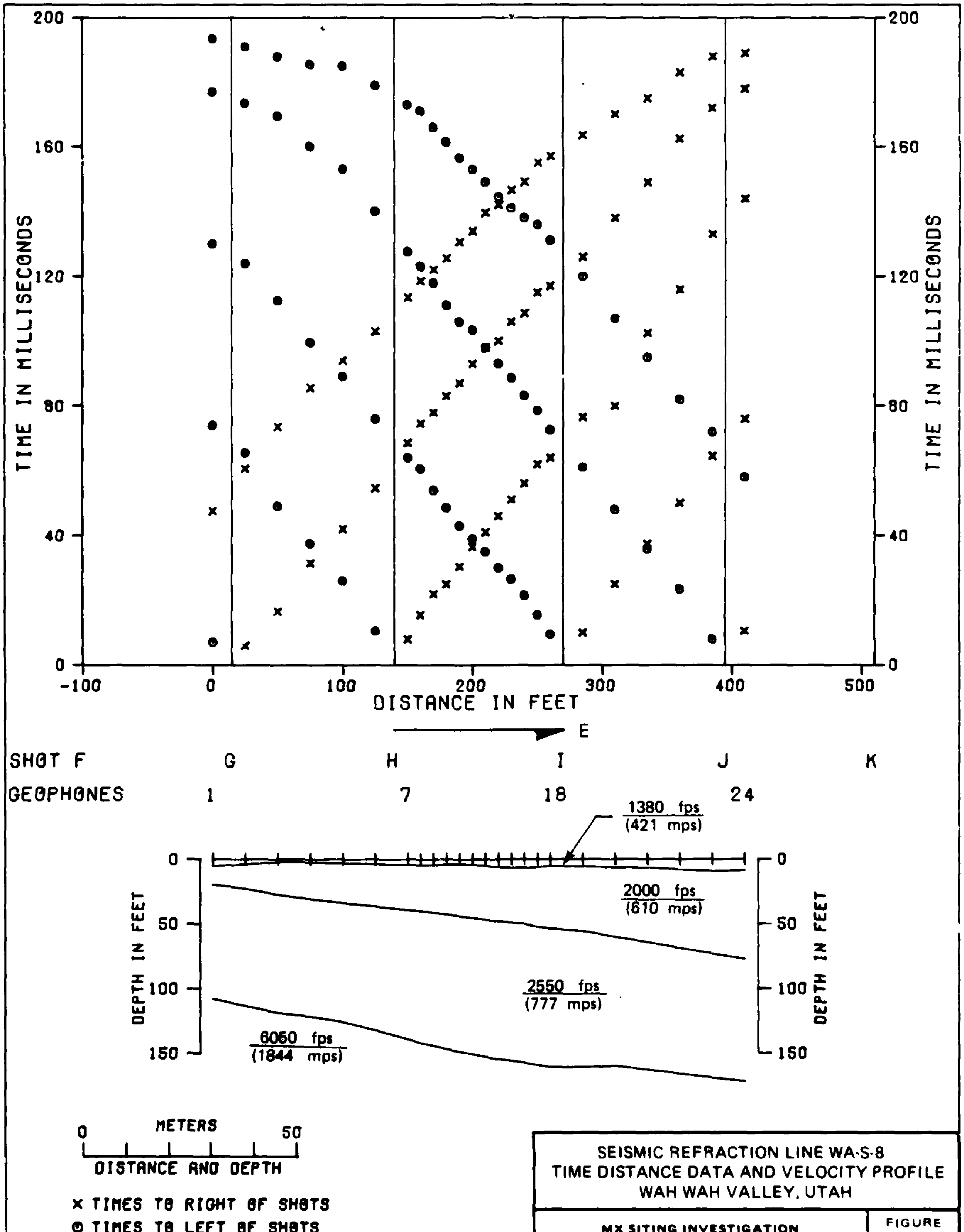
SEISMIC REFRACTION LINE WA-S-7
TIME DISTANCE DATA AND VELOCITY PROFILE
WAH WAH VALLEY, UTAH

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE – BMO

FIGURE II-3-7

FUGRO NATIONAL, INC.

FN-TR-27-WA-II



SEISMIC REFRACTION LINE WA-S-8
TIME DISTANCE DATA AND VELOCITY PROFILE
WAH WAH VALLEY, UTAH

MX SITING INVESTIGATION

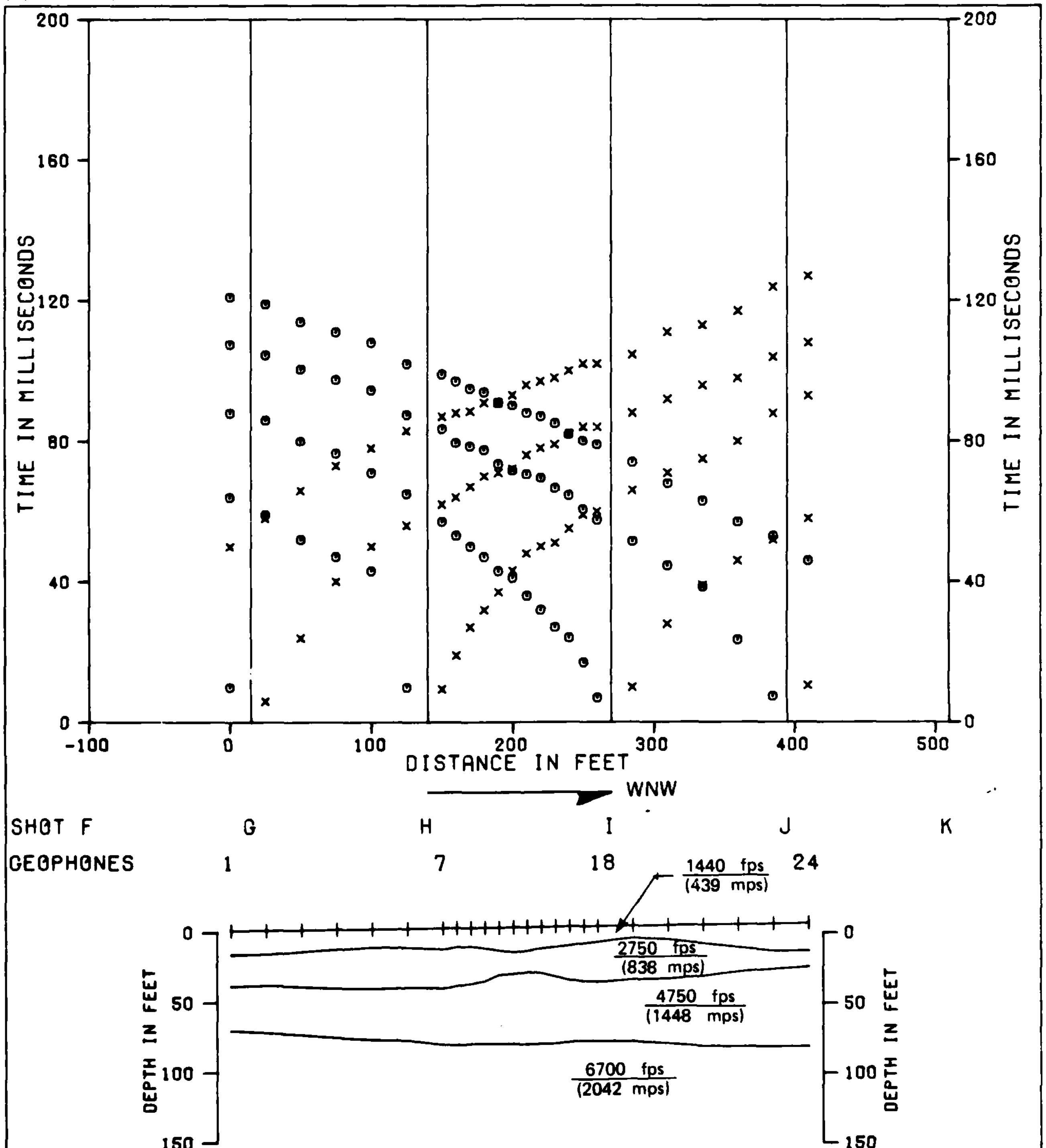
DEPARTMENT OF THE AIR FORCE – BMO

FIGURE II-3-8

FUGRO NATIONAL, INC.

24 MAR 81

FN-TR-27-WA-II



0 METERS 50

DISTANCE AND DEPTH

× TIMES TO RIGHT OF SHOTS

⊙ TIMES TO LEFT OF SHOTS

SEISMIC REFRACTION LINE WA-S-9
TIME DISTANCE DATA AND VELOCITY PROFILE
WAH WAH VALLEY, UTAH

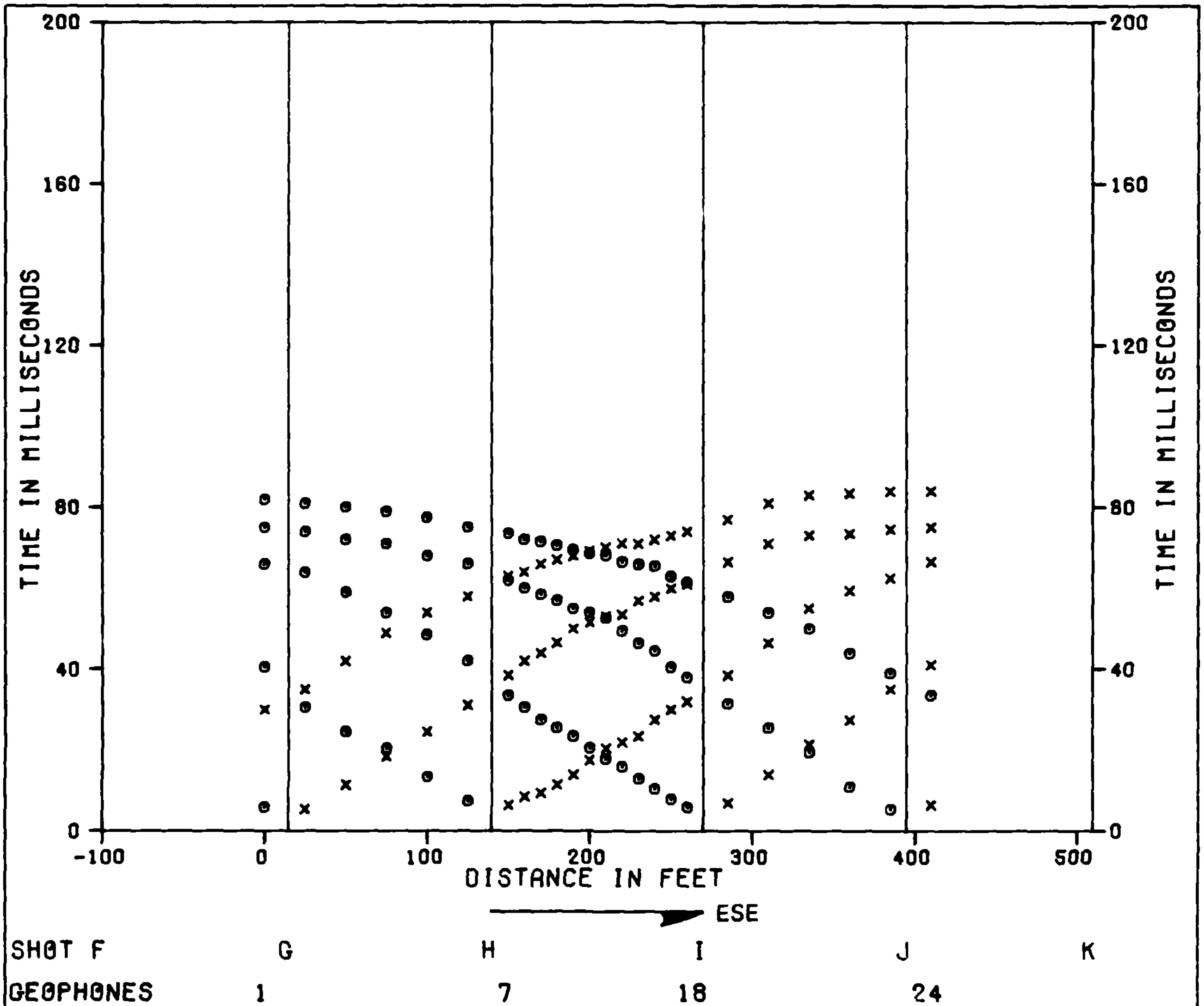
MX SITING INVESTIGATION

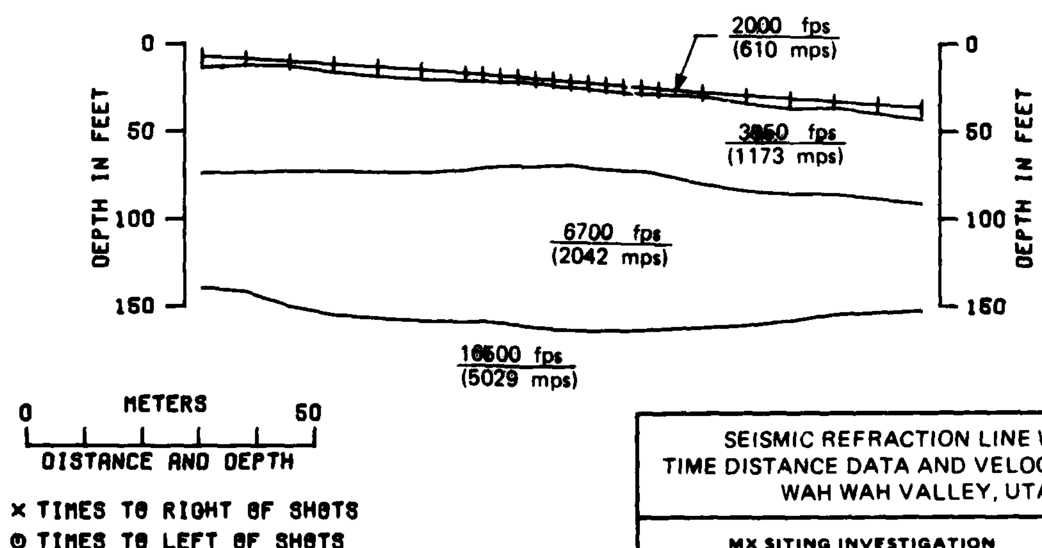
DEPARTMENT OF THE AIR FORCE – BMO

FIGURE II-3-9

FUGRO NATIONAL, INC.

24 MAR 81



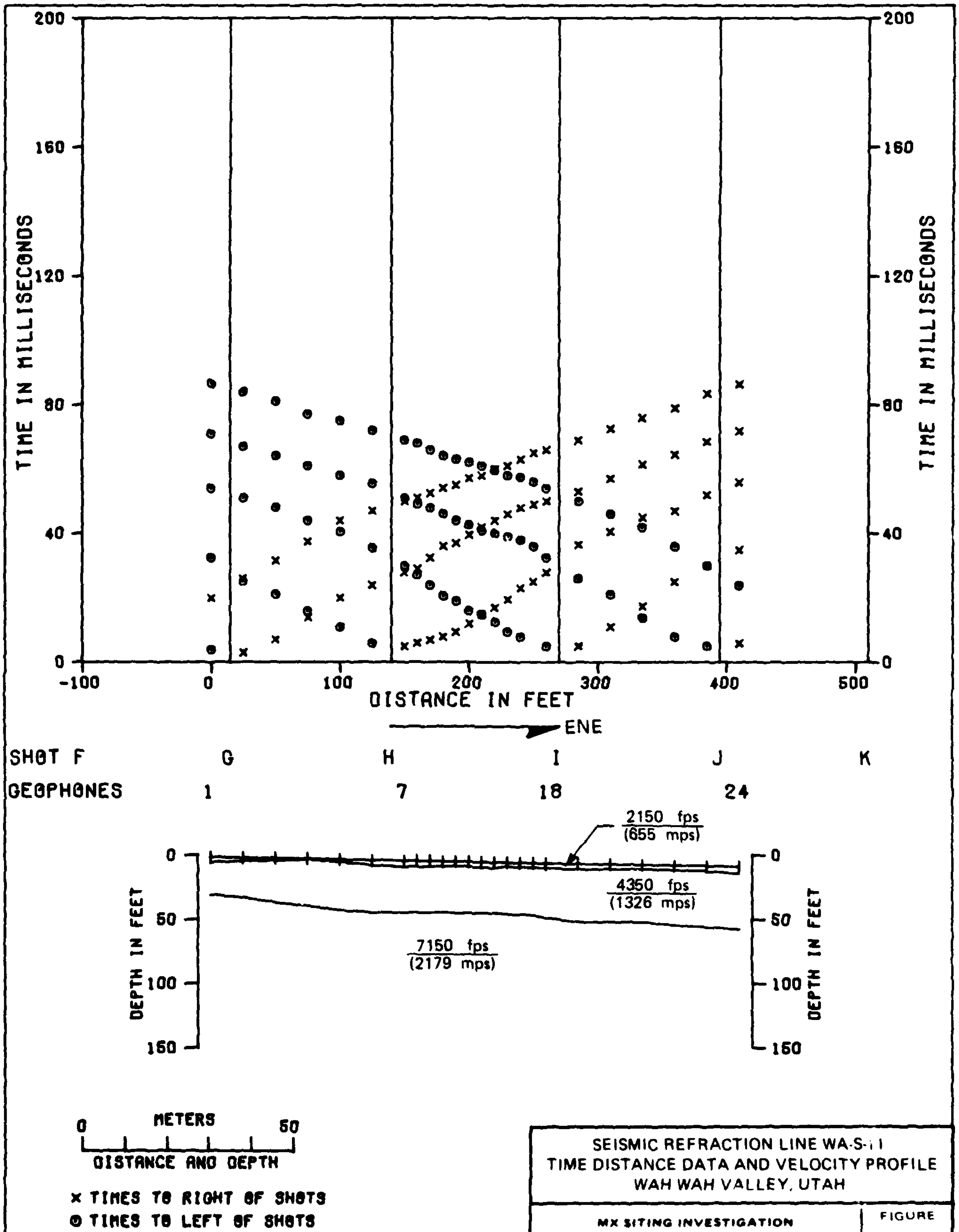


SEISMIC REFRACTION LINE WA-S-10
TIME DISTANCE DATA AND VELOCITY PROFILE
WAH WAH VALLEY, UTAH

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE — BMO

FIGURE
II-3-10

FUGRO NATIONAL, INC.



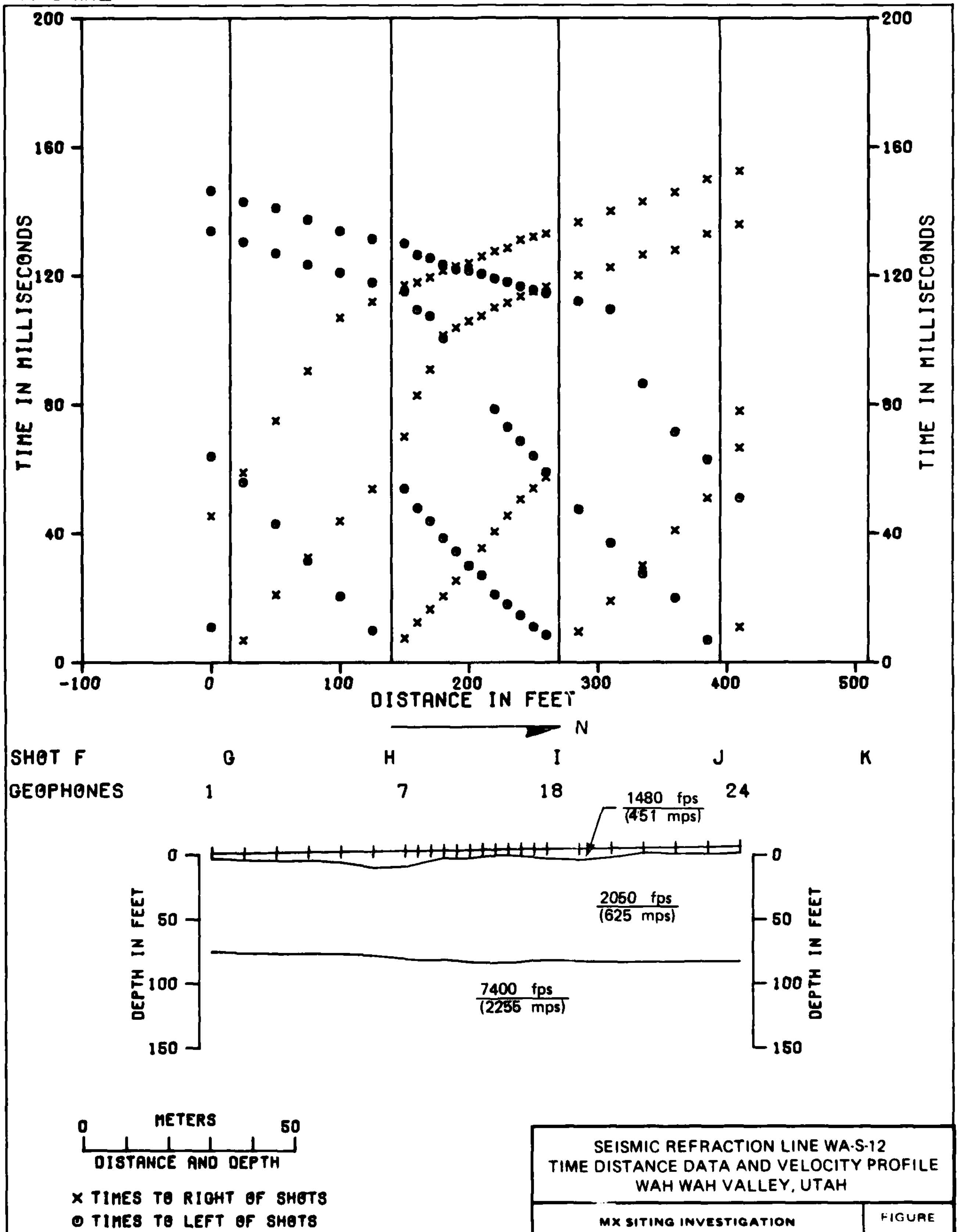
SEISMIC REFRACTION LINE WA-S-11
TIME DISTANCE DATA AND VELOCITY PROFILE
WAH WAH VALLEY, UTAH

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE – BMO

FIGURE II-3-11

FUGRO NATIONAL, INC.

FN-TR-27-WA-II



SEISMIC REFRACTION LINE WA-S-12
TIME DISTANCE DATA AND VELOCITY PROFILE
WAH WAH VALLEY, UTAH

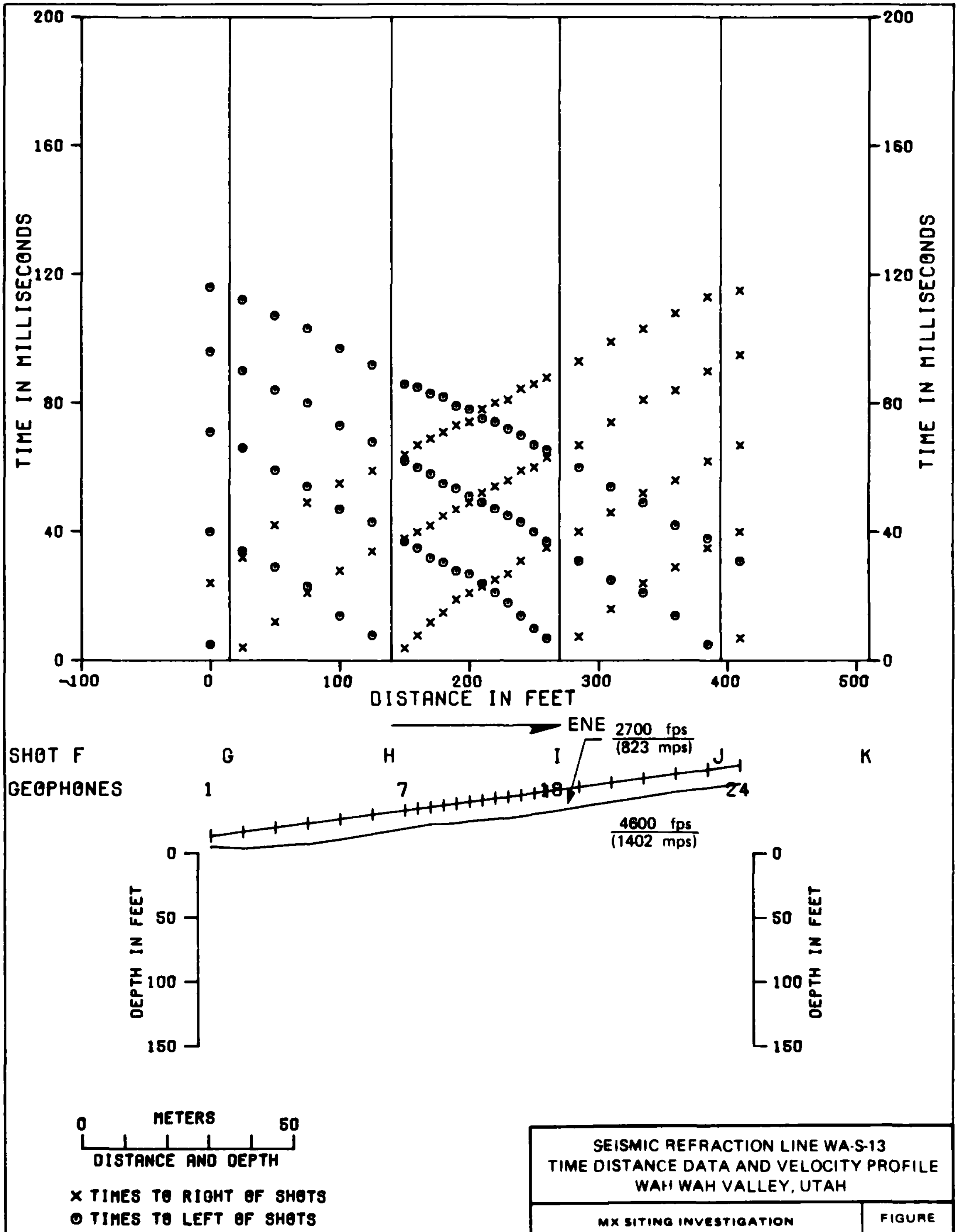
MX SITING INVESTIGATION

DEPARTMENT OF THE AIR FORCE — BMO

FIGURE II-3-12

FUGRO NATIONAL, INC.

24 MAR 81



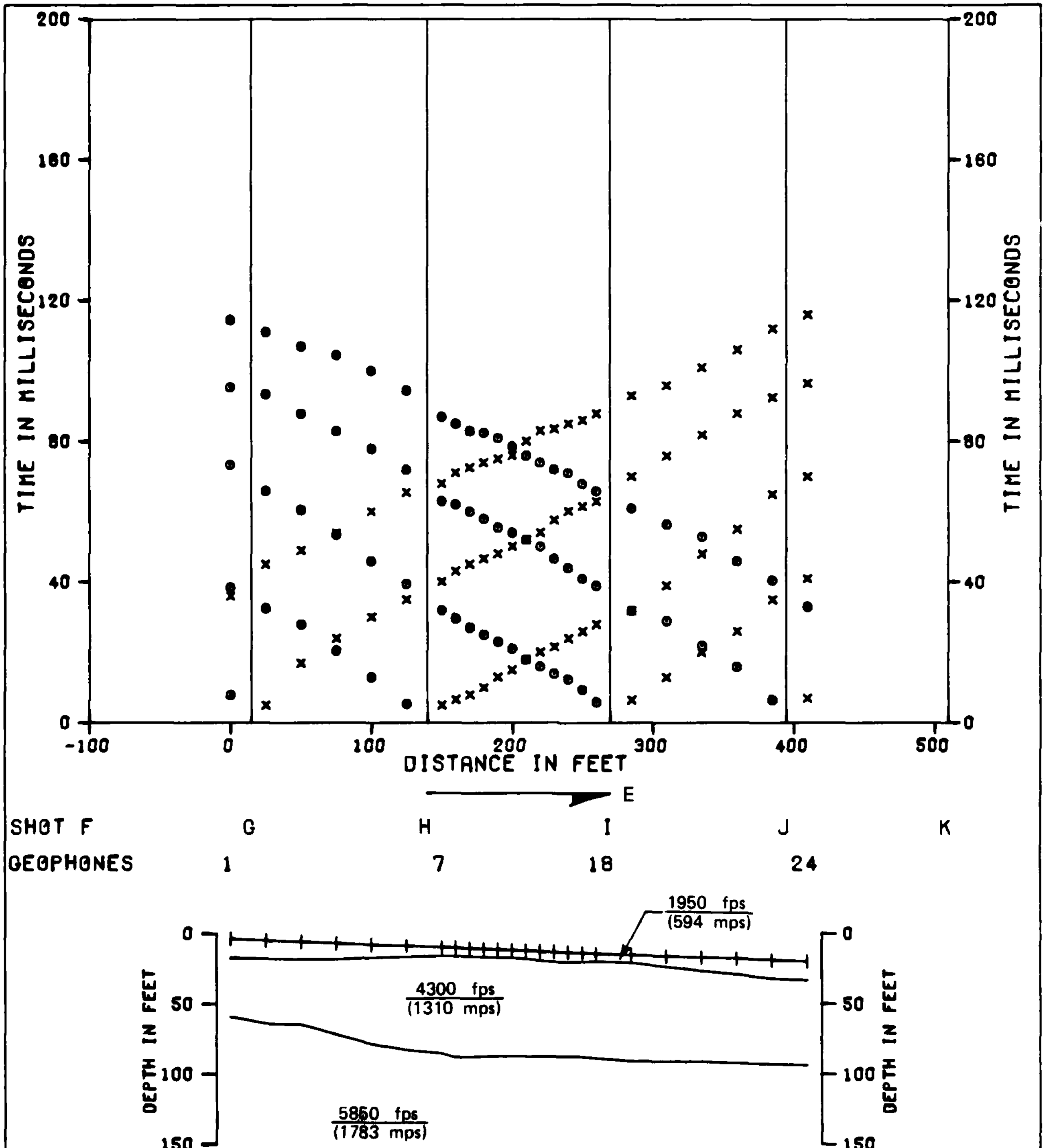
SEISMIC REFRACTION LINE WA-S-13
TIME DISTANCE DATA AND VELOCITY PROFILE
WAH WAH VALLEY, UTAH

MX SITING INVESTIGATION

DEPARTMENT OF THE AIR FORCE – BMO

FIGURE II-3-13

FUGRO NATIONAL, INC.



0 METERS 50

DISTANCE AND DEPTH

× TIMES TO RIGHT OF SHOTS

⊙ TIMES TO LEFT OF SHOTS

SEISMIC REFRACTION LINE WA-S-14
TIME DISTANCE DATA AND VELOCITY PROFILE
WAH WAH VALLEY, UTAH

MX SITING INVESTIGATION

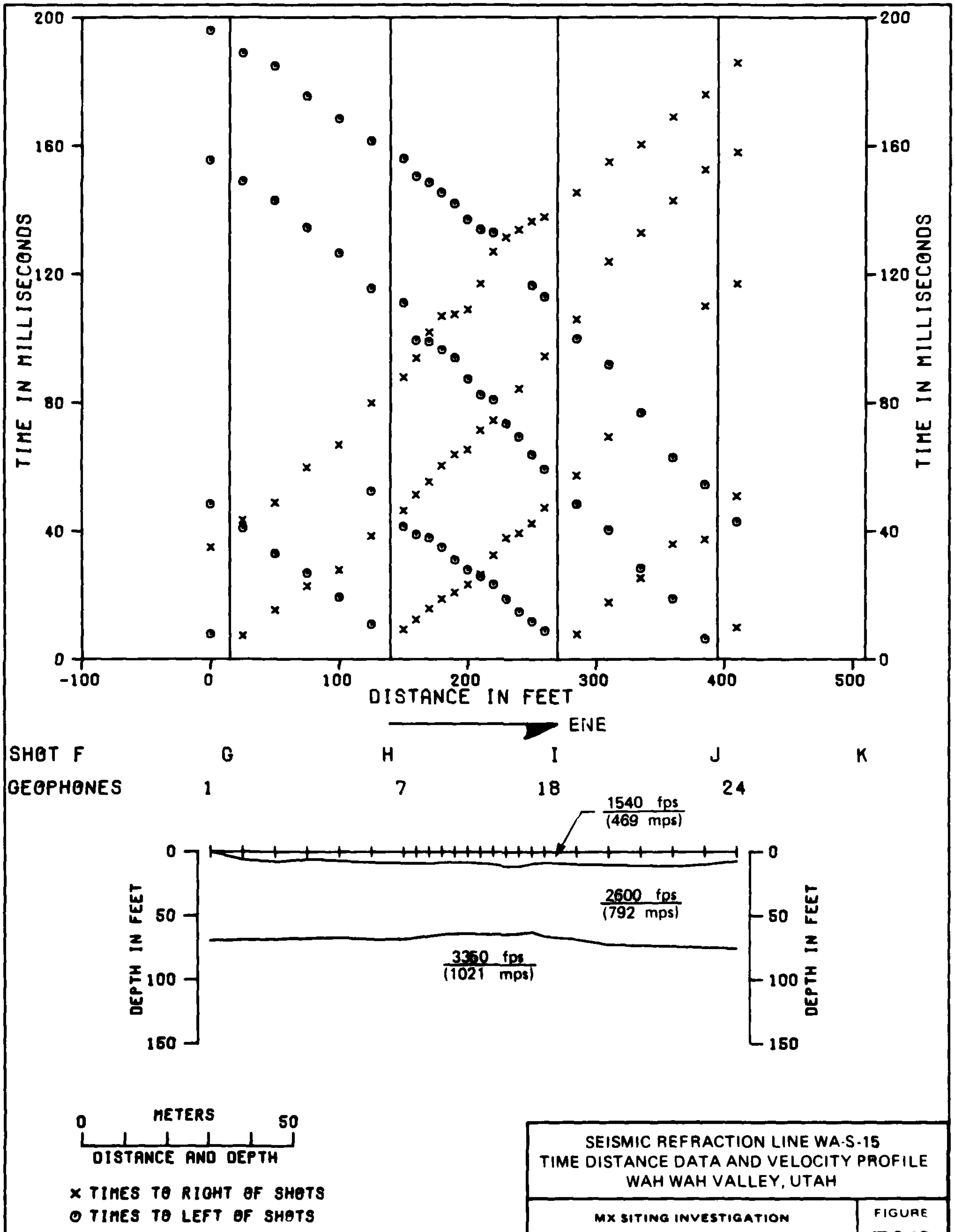
DEPARTMENT OF THE AIR FORCE – BMO

FIGURE

II-3-14

FUGRO NATIONAL, INC.

FN-TR-27-WA-II

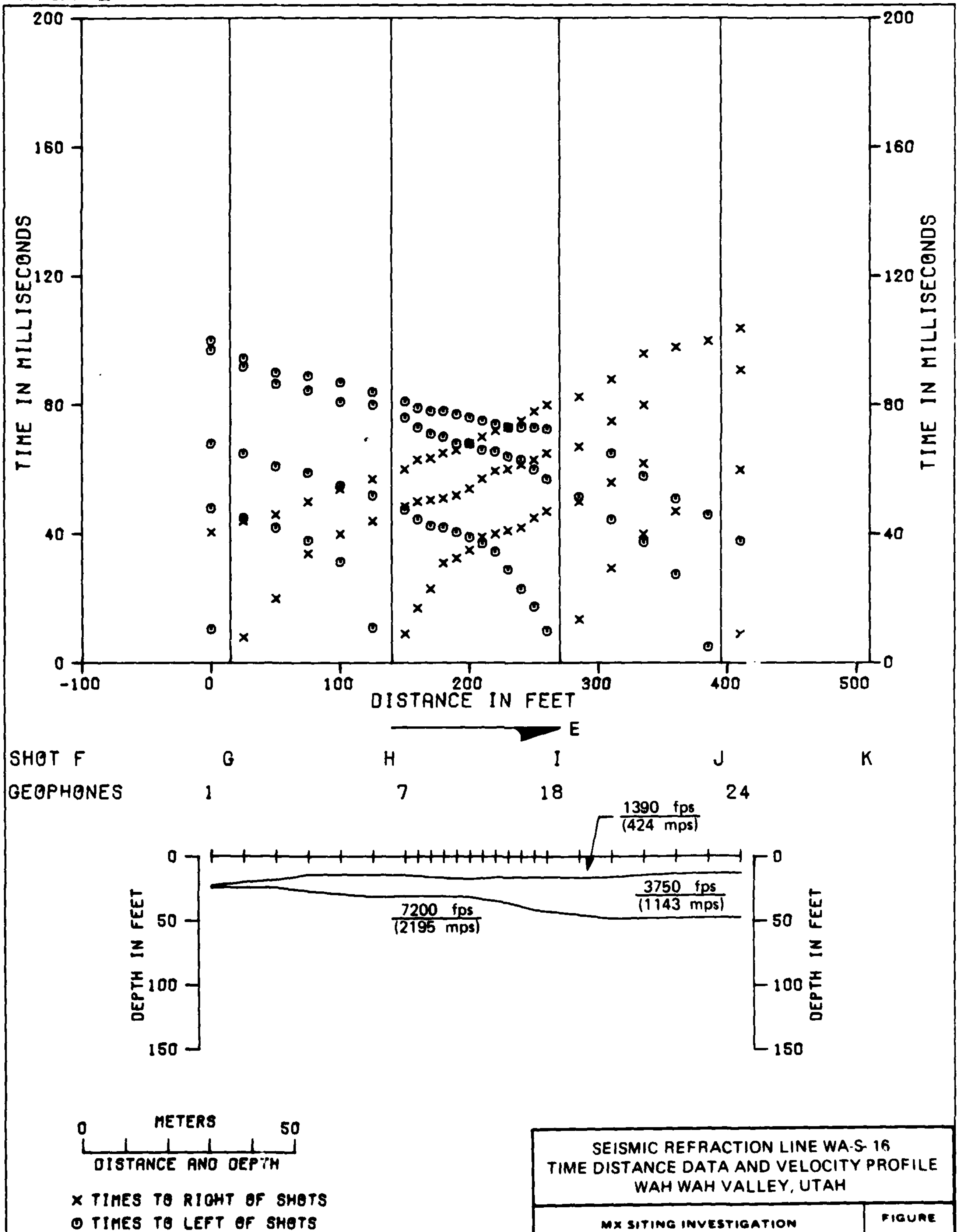


SEISMIC REFRACTION LINE WA-S-15
TIME DISTANCE DATA AND VELOCITY PROFILE
WAH WAH VALLEY, UTAH

MX SITING INVESTIGATION DEPARTMENT OF THE AIR FORCE – BMO	FIGURE II-3-15

FUGRO NATIONAL, INC.

24 MAR 81



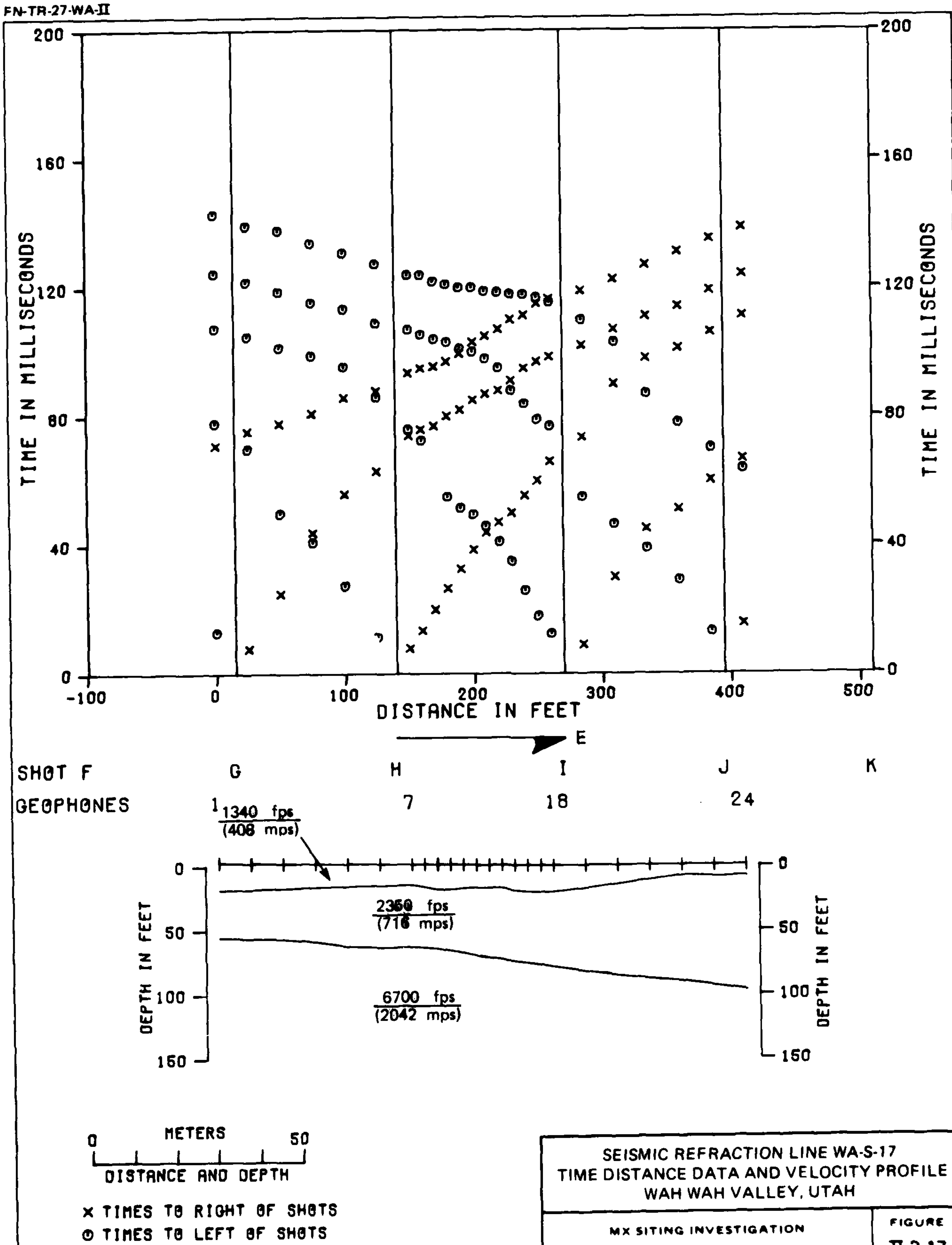
SEISMIC REFRACTION LINE WA-S-16
TIME DISTANCE DATA AND VELOCITY PROFILE
WAH WAH VALLEY, UTAH

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE – BMO

FIGURE II-3-16

FUGRO NATIONAL, INC.

FN-TR-27-WA-II



SEISMIC REFRACTION LINE WA-S-17
TIME DISTANCE DATA AND VELOCITY PROFILE
WAH WAH VALLEY, UTAH

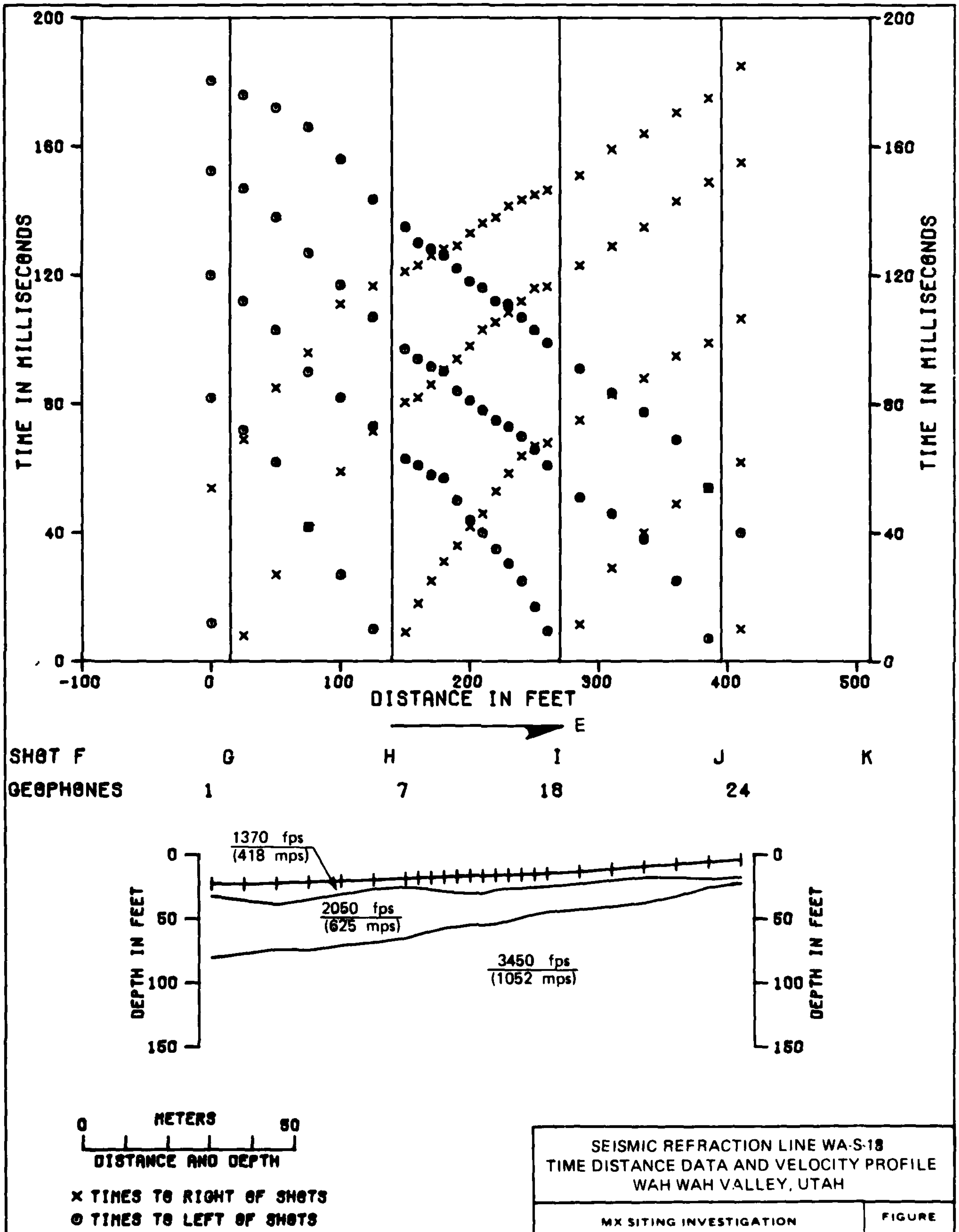
MX SITING INVESTIGATION

DEPARTMENT OF THE AIR FORCE -- BMO

FIGURE II-3-17

FUGRO NATIONAL, INC.

24 MAR 81

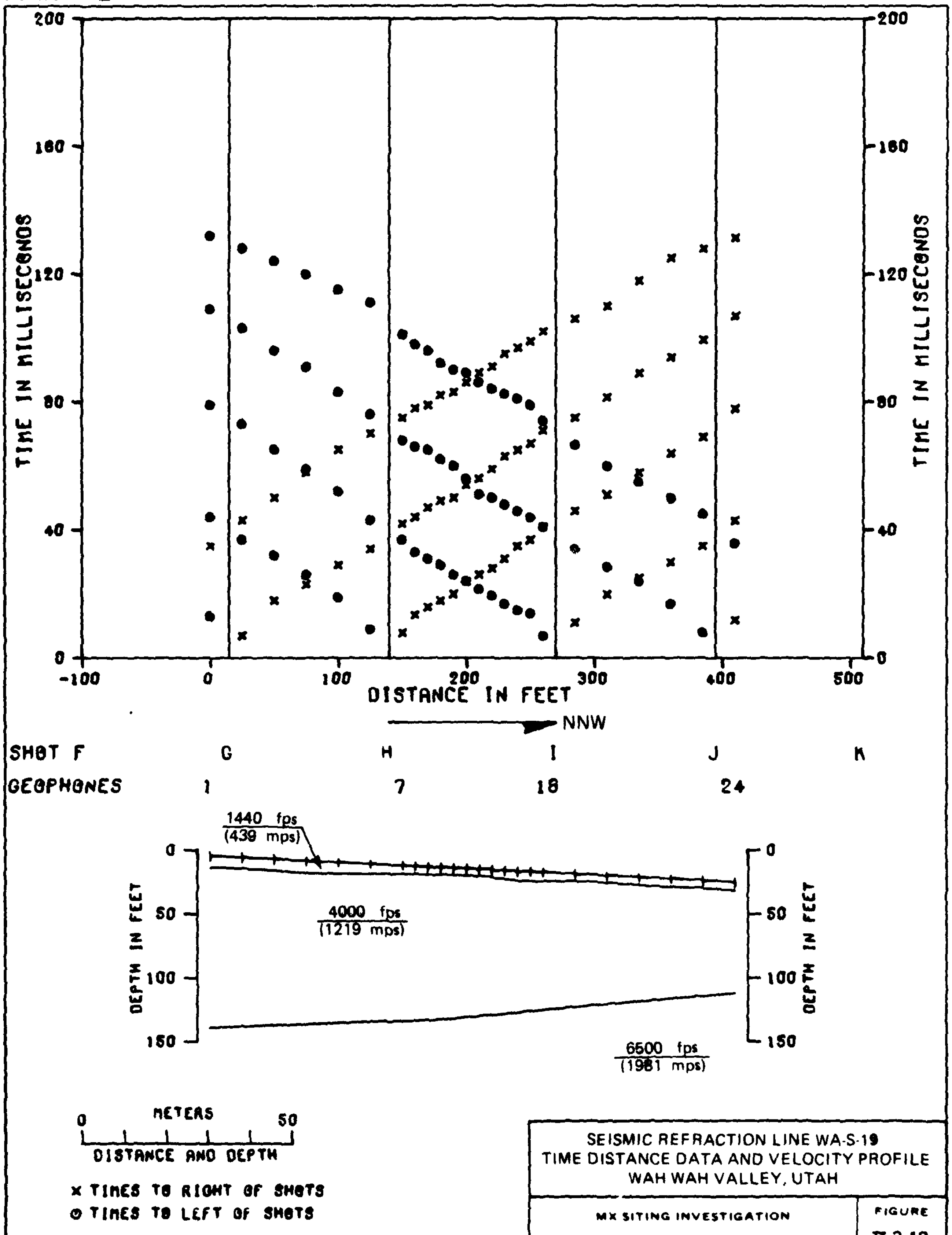


SEISMIC REFRACTION LINE WA-S-18
TIME DISTANCE DATA AND VELOCITY PROFILE
WAH WAH VALLEY, UTAH

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE – BMO

FIGURE II-3-18

FUGRO NATIONAL, INC.

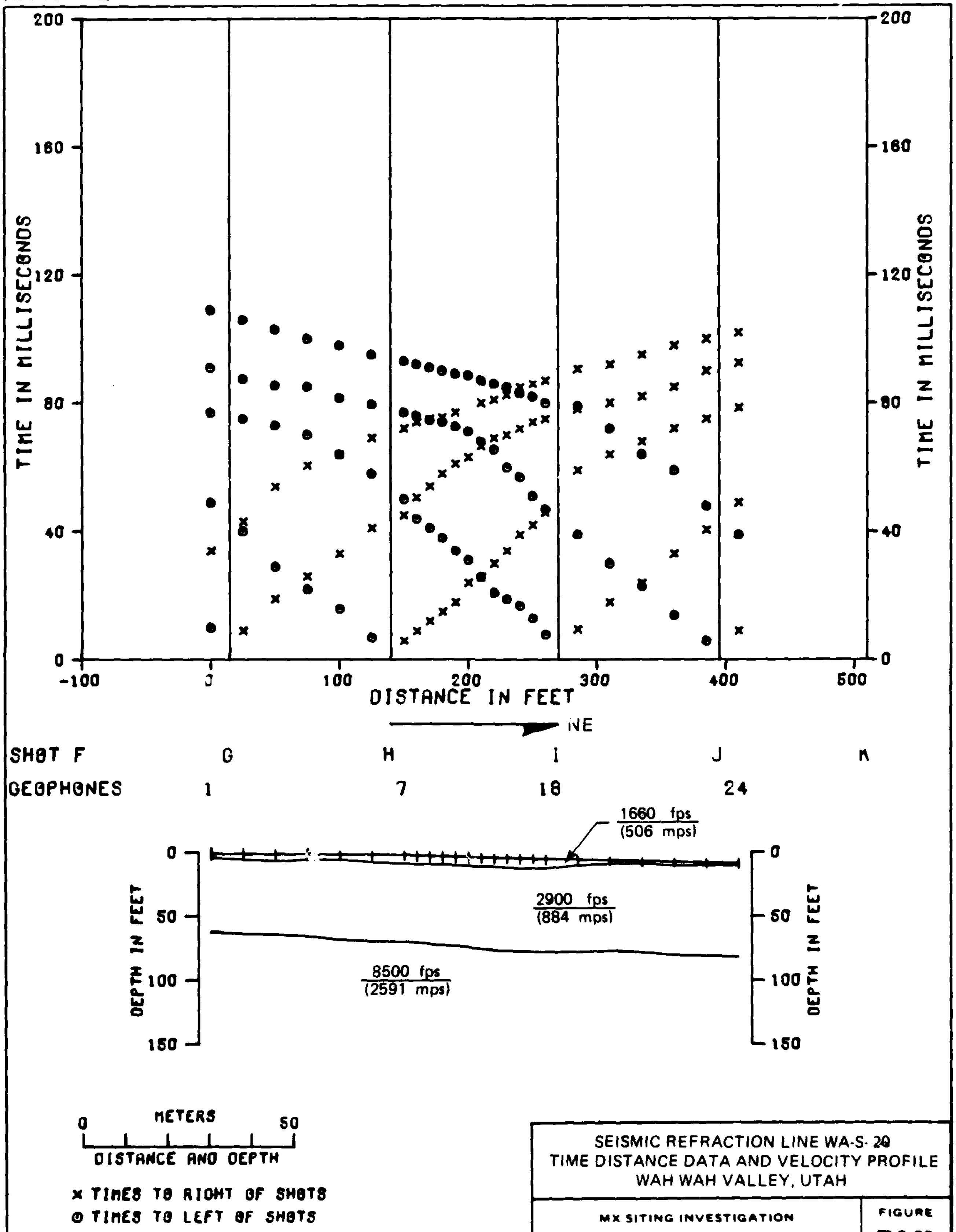


SEISMIC REFRACTION LINE WA-S-19
TIME DISTANCE DATA AND VELOCITY PROFILE
WAH WAH VALLEY, UTAH

MX SITING INVESTIGATION DEPARTMENT OF THE AIR FORCE – BMO	FIGURE II-3-19

FUGRO NATIONAL, INC.

FN-TR-27-WA-II



SEISMIC REFRACTION LINE WA-S-20
TIME DISTANCE DATA AND VELOCITY PROFILE
WAH WAH VALLEY, UTAH

MX SITING INVESTIGATION

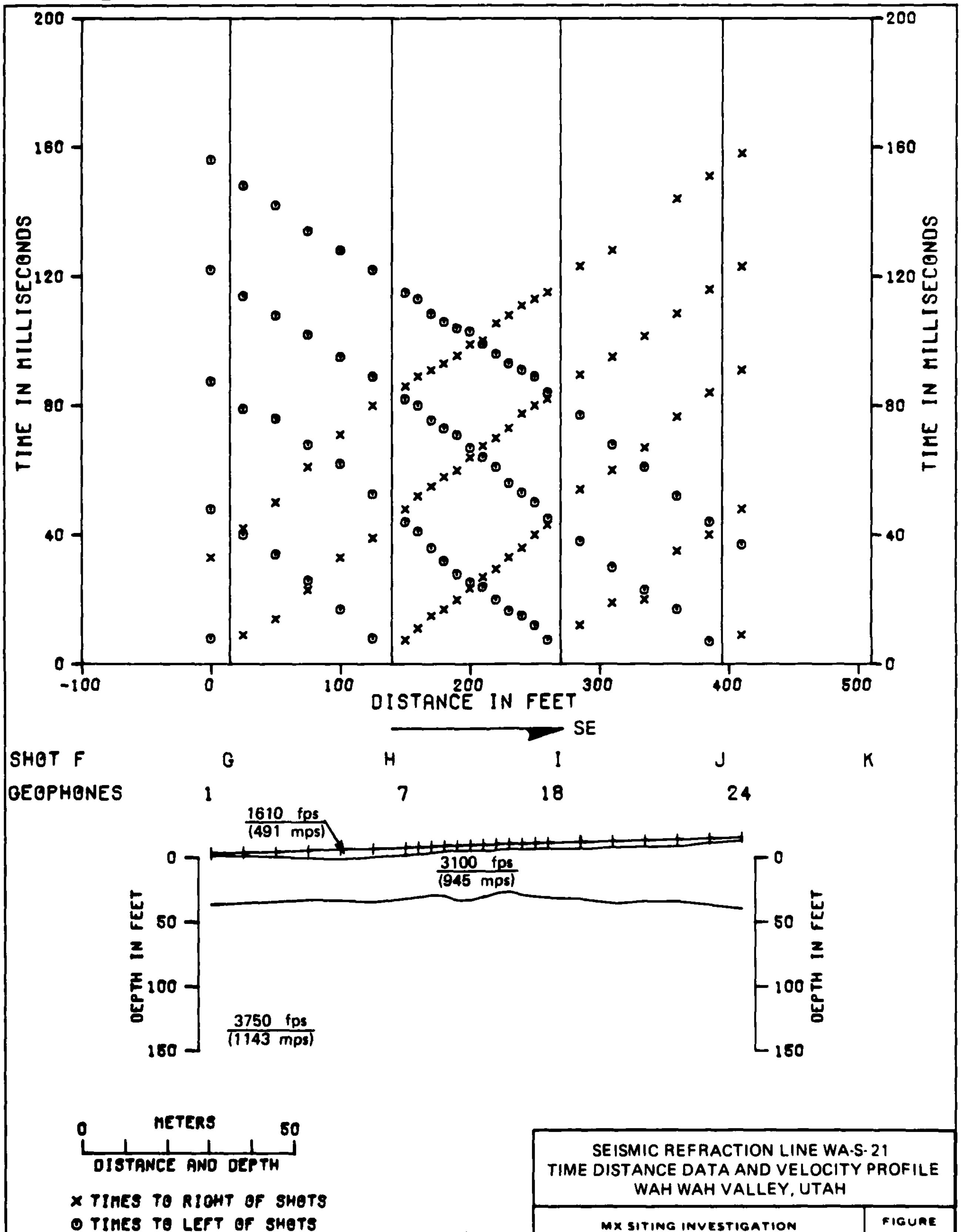
DEPARTMENT OF THE AIR FORCE – BMO

FIGURE II-3-20

FUGRO NATIONAL, INC.

24 MAR 81

FN-TR-27-WA-II



SEISMIC REFRACTION LINE WA-S-21
TIME DISTANCE DATA AND VELOCITY PROFILE
WAH WAH VALLEY, UTAH

MX SITING INVESTIGATION DEPARTMENT OF THE AIR FORCE – BMO	FIGURE II-3-21

FUGRO NATIONAL, INC.

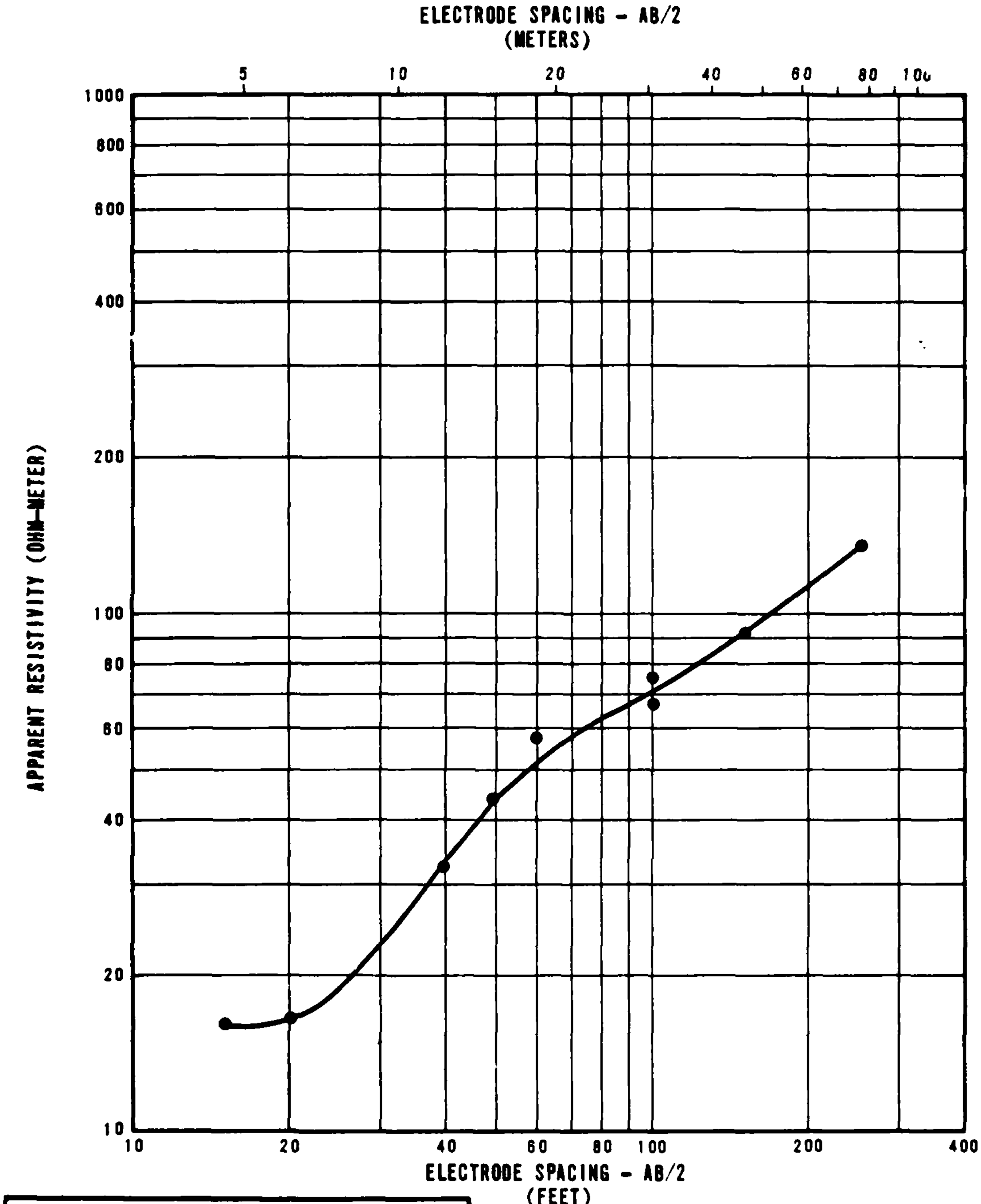
24 MAR 81

4.0 ELECTRICAL RESISTIVITY DATA

Explanation: Each figure in this section presents the data obtained from a resistivity sounding and a tabulated model of resistivity layers that would produce a curve similar to the observed curve.

The upper portion of the figures is a graph in which measured apparent resistivity values in ohm-meters are plotted versus one-half the distance between the current electrodes.

The interpreted model tabulated at the bottom of the page shows a combination of true resistivity layers and thicknesses obtained by matching theoretical curves to the field curve.



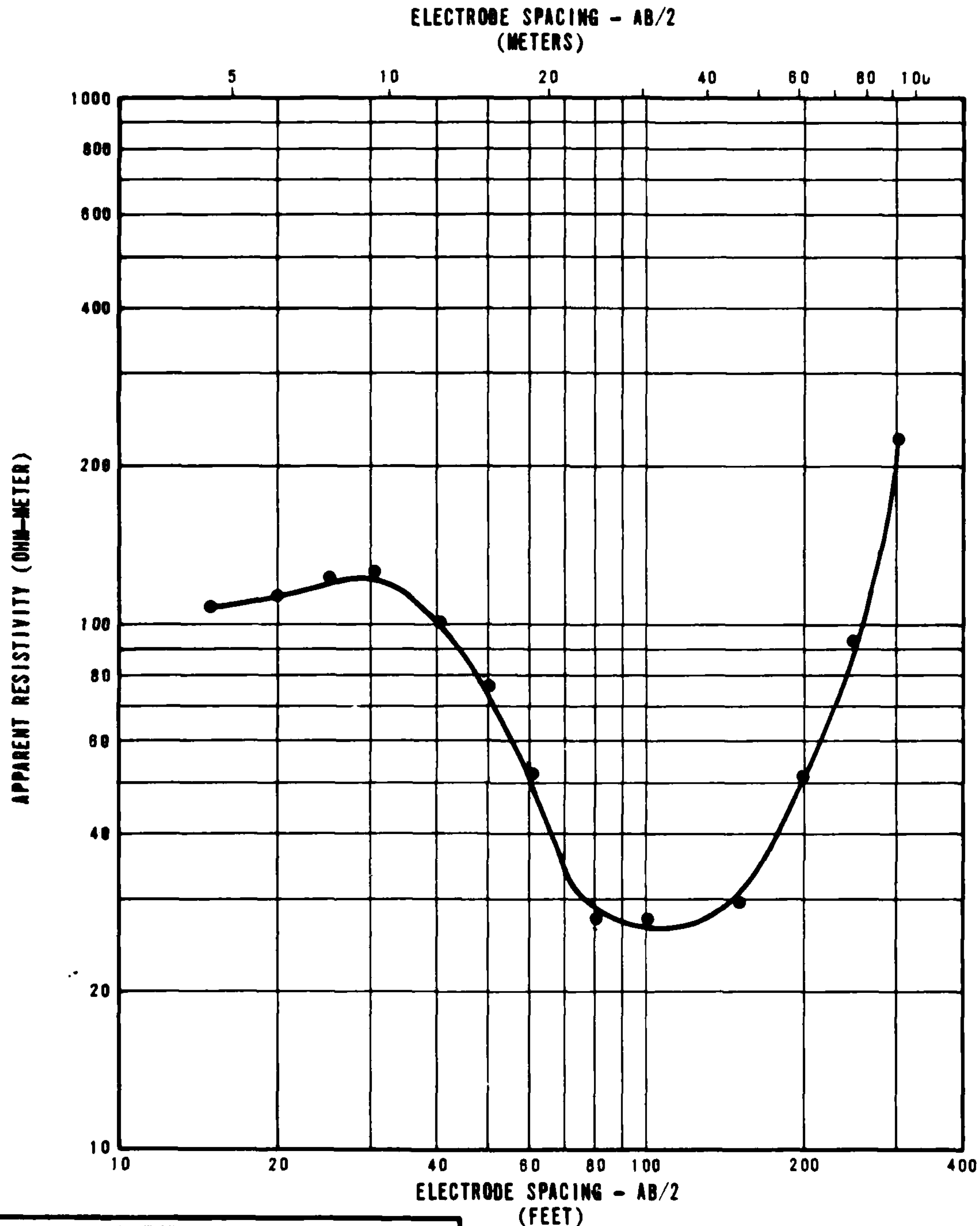
INTERPRETED MODEL		
LAYER DEPTH		RESISTIVITY VALUES
FEET	METERS	OHM-METER
0	0	16
13	4	86
34	10	170
66	20	250

RESISTIVITY SOUNDING WA-R-1
SOUNDING CURVE AND INTERPRETATION
WAH WAH VALLEY, UTAH

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - BMO

FIGURE II-4-1

FUGRO NATIONAL, INC.



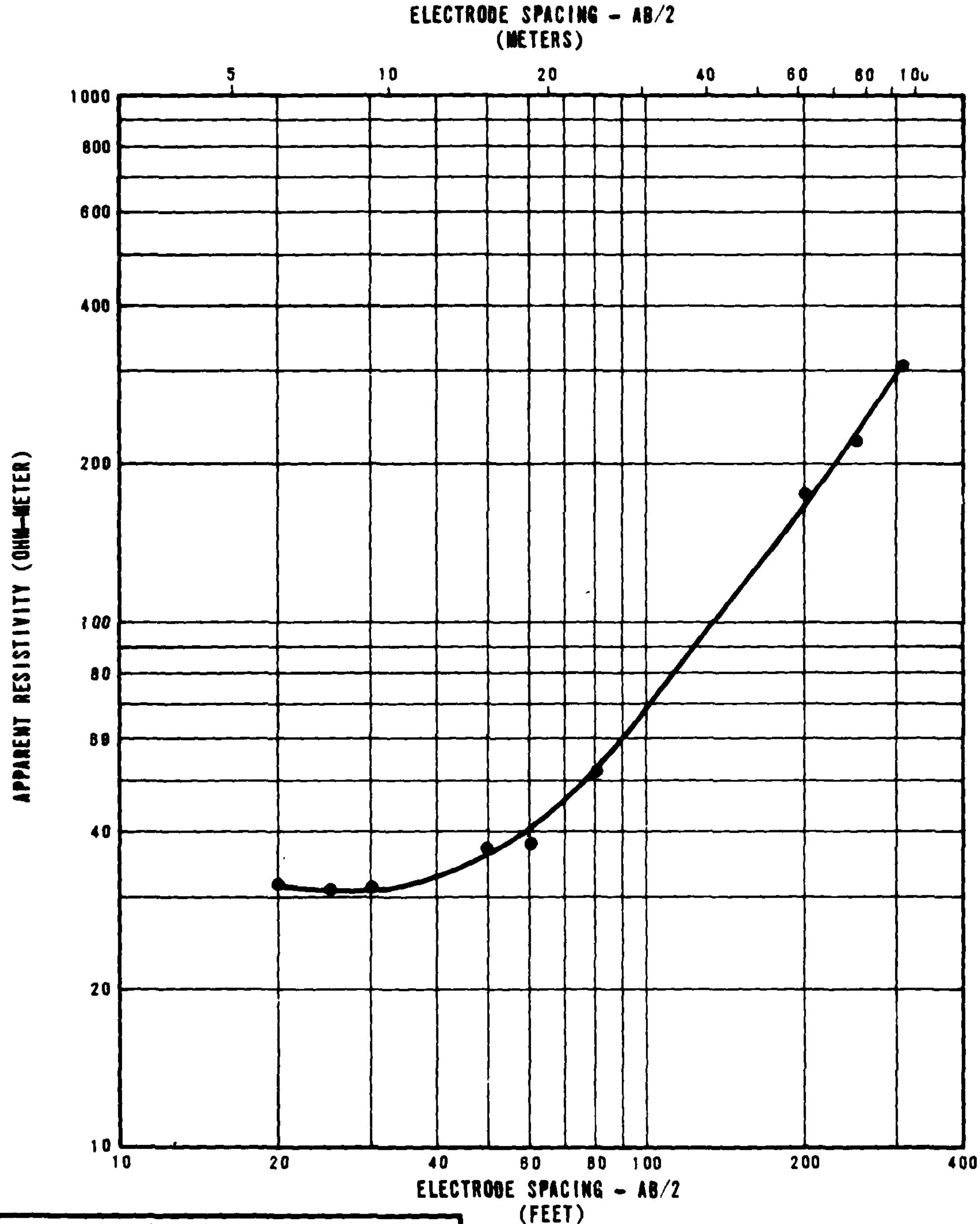
INTERPRETED MODEL		
LAYER DEPTH		RESISTIVITY VALUES
FEET	METERS	OHM-METER
0	0	110
24	7	13
46	14	100
92	28	640

RESISTIVITY SOUNDING WA-R-2
SOUNDING CURVE AND INTERPRETATION
WAH WAH VALLEY, UTAH

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE BMO

FIGURE II-4-2

FUGRO NATIONAL, INC.



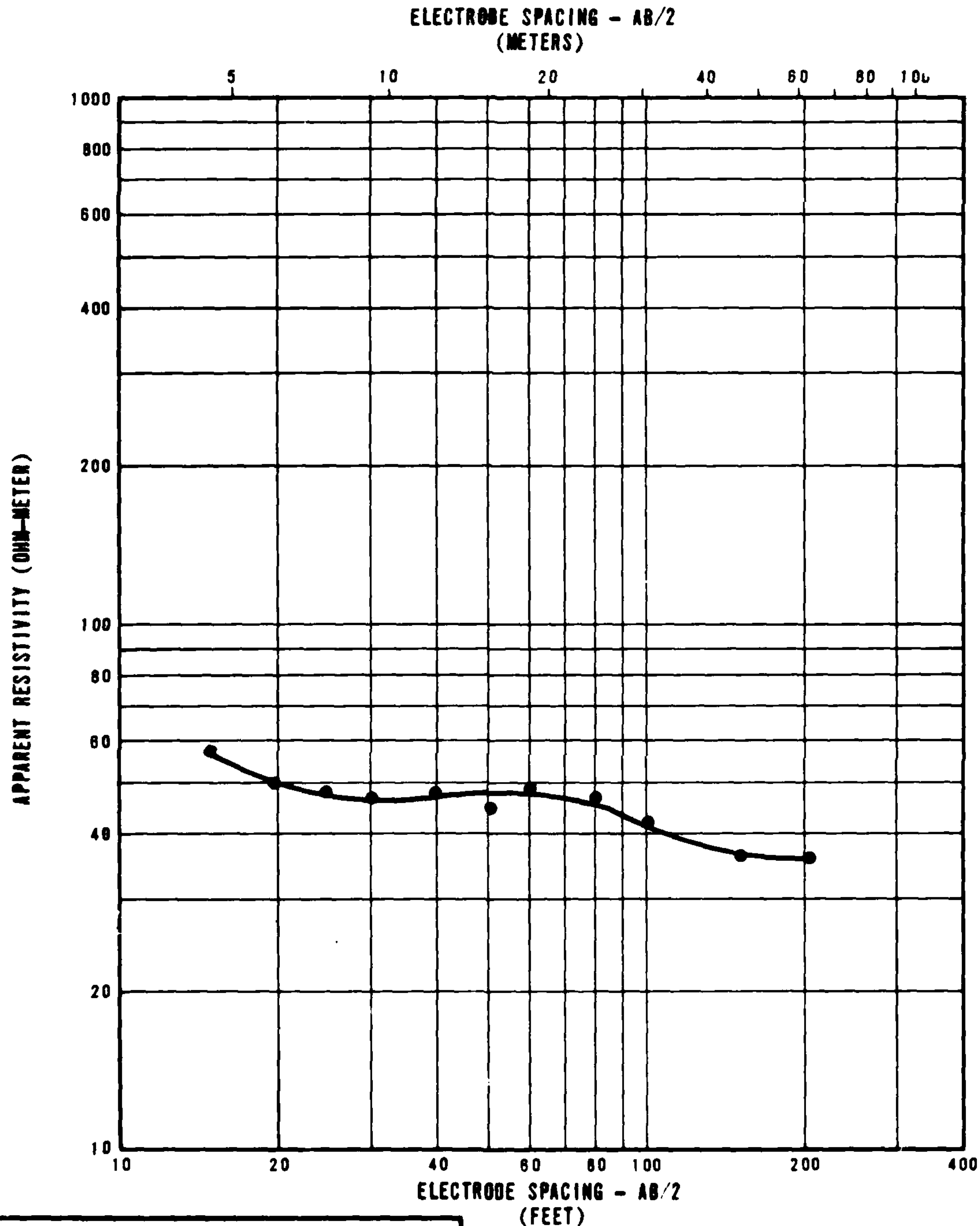
INTERPRETED MODEL		
LAYER DEPTH		RESISTIVITY VALUES
FEET	METERS	OHM-METER
0	0	30
32	10	55
44	13	340
73	22	950

RESISTIVITY SOUNDING WA-R-3
SOUNDING CURVE AND INTERPRETATION
WAH WAH VALLEY, UTAH

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE BMO

FIGURE
II-4-3

FUGRO NATIONAL, INC.



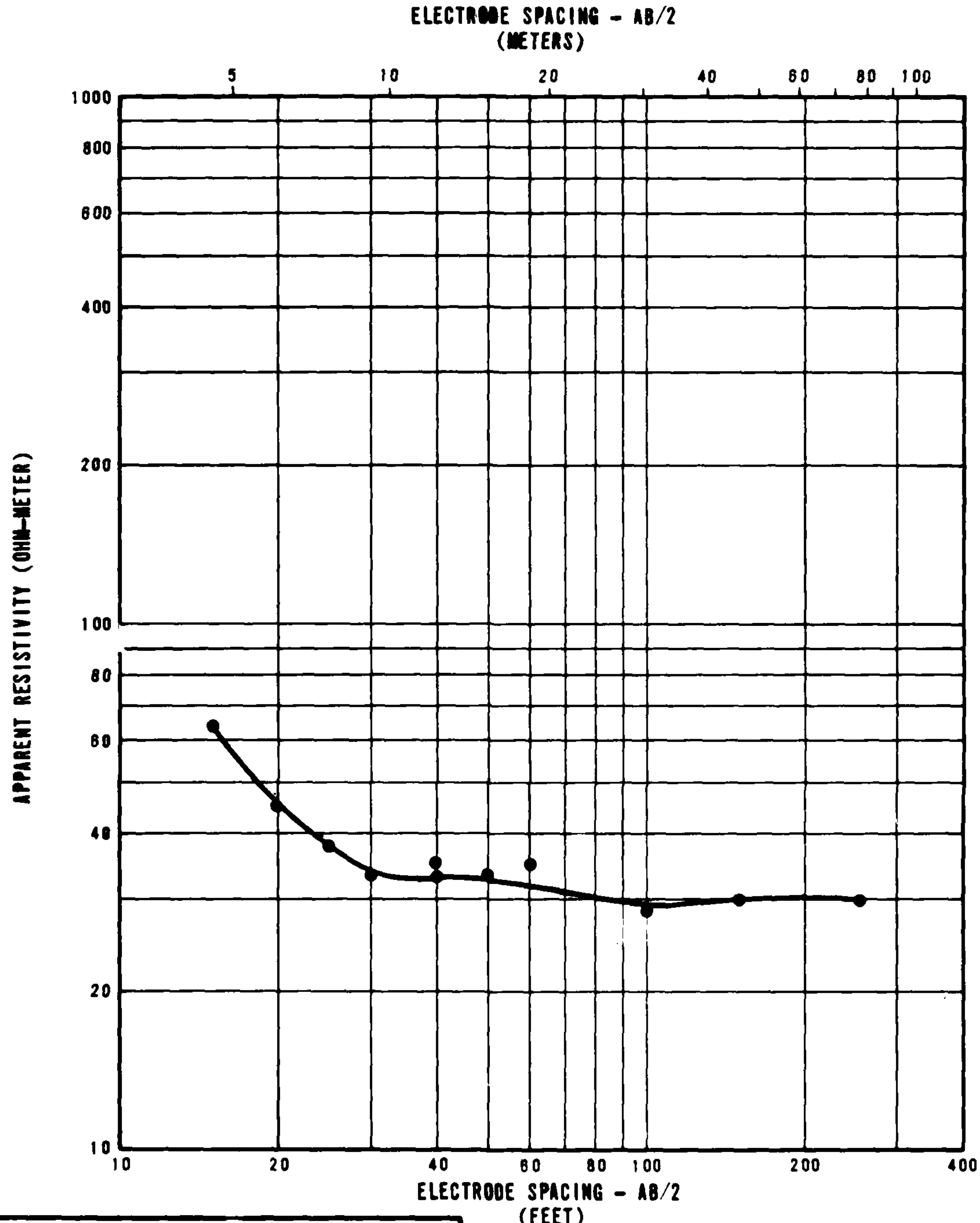
INTERPRETED MODEL		
LAYER DEPTH		RESISTIVITY VALUES
FEET	METERS	OHM-METER
0	0	60
14	4	40
21	6	50
60	18	30

RESISTIVITY SOUNDING WA-R-4
SOUNDING CURVE AND INTERPRETATION
WAH WAH VALLEY, UTAH

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE BMO

FIGURE II-4-4

FUGRO NATIONAL, INC.



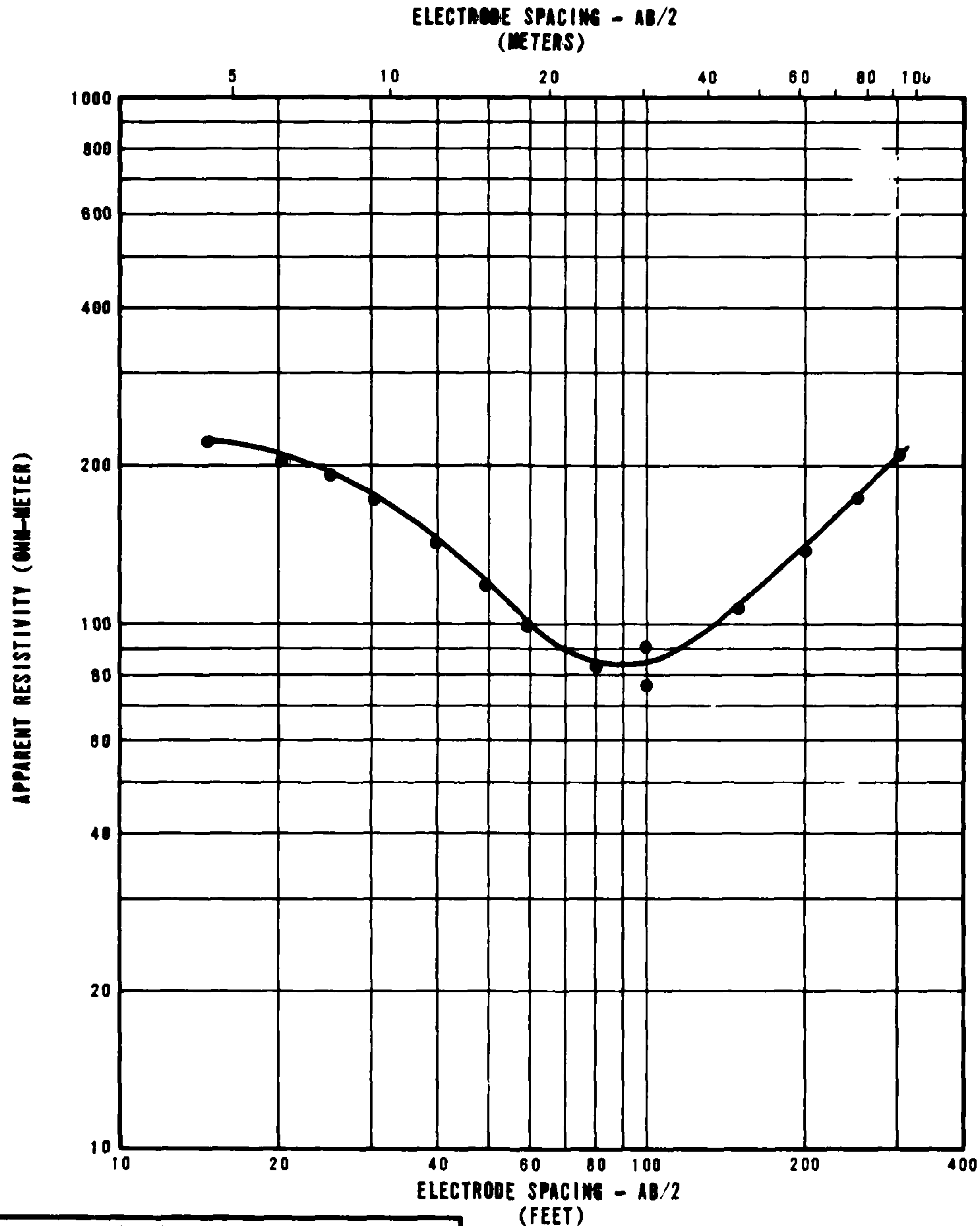
INTERPRETED MODEL		
LAYER DEPTH		RESISTIVITY VALUES
FEET	METERS	OHM-METER
0	0	115
8	2	30
36	11	12
47	14	45
93	28	15

RESISTIVITY SOUNDING WA-R-5
SOUNDING CURVE AND INTERPRETATION
WAH WAH VALLEY, UTAH

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE BMO

FIGURE II-4-5

FUGRO NATIONAL, INC.



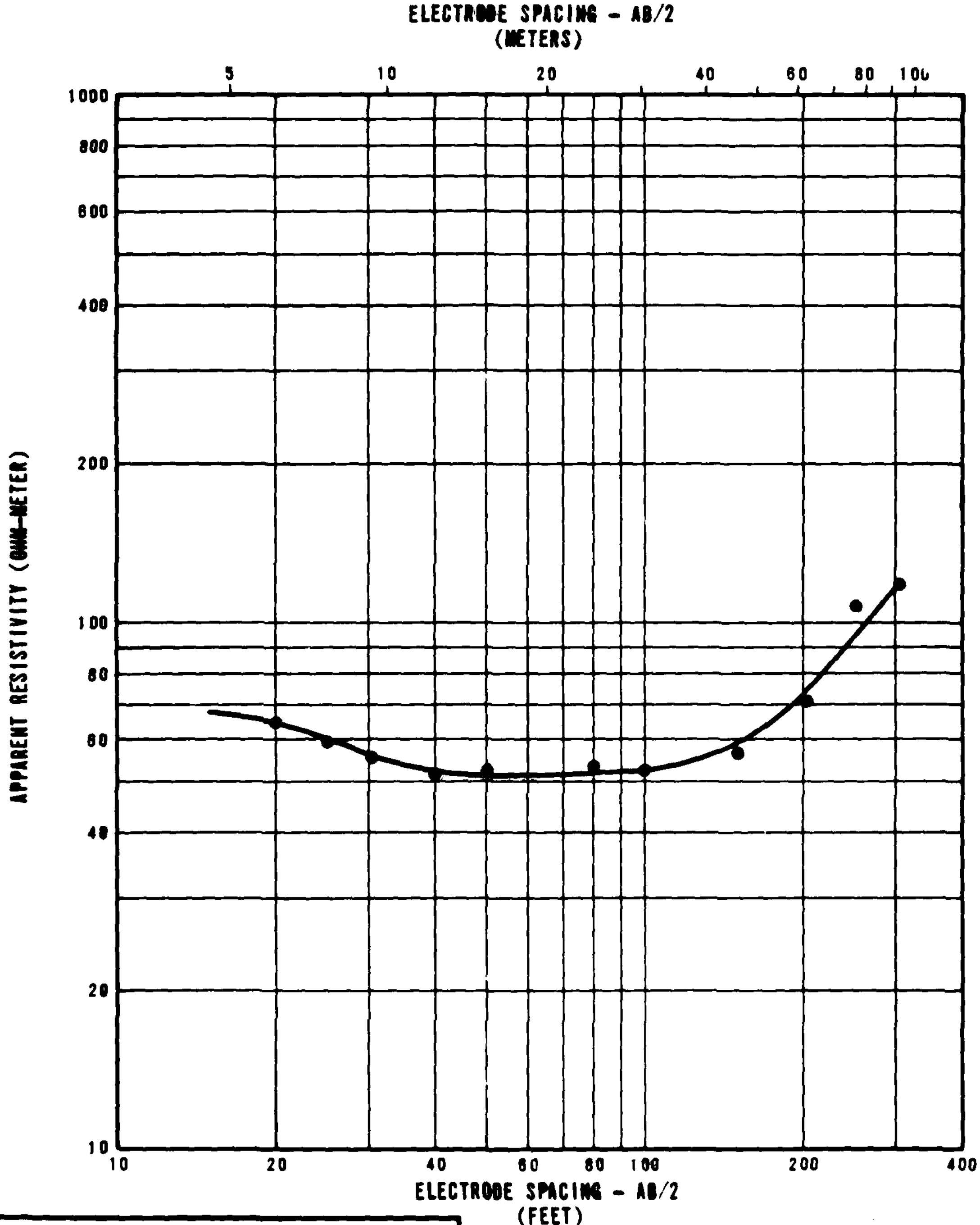
INTERPRETED MODEL		
LAYER DEPTH		RESISTIVITY VALUES
FEET	METERS	OHM-METER
0	0	200
17	5	100
28	9	40
56	17	65
83	25	340

RESISTIVITY SOUNDING WA-R-8
SOUNDING CURVE AND INTERPRETATION
WAH WAH VALLEY, UTAH

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE BMO

FIGURE II-4-6

FUGRO NATIONAL, INC.



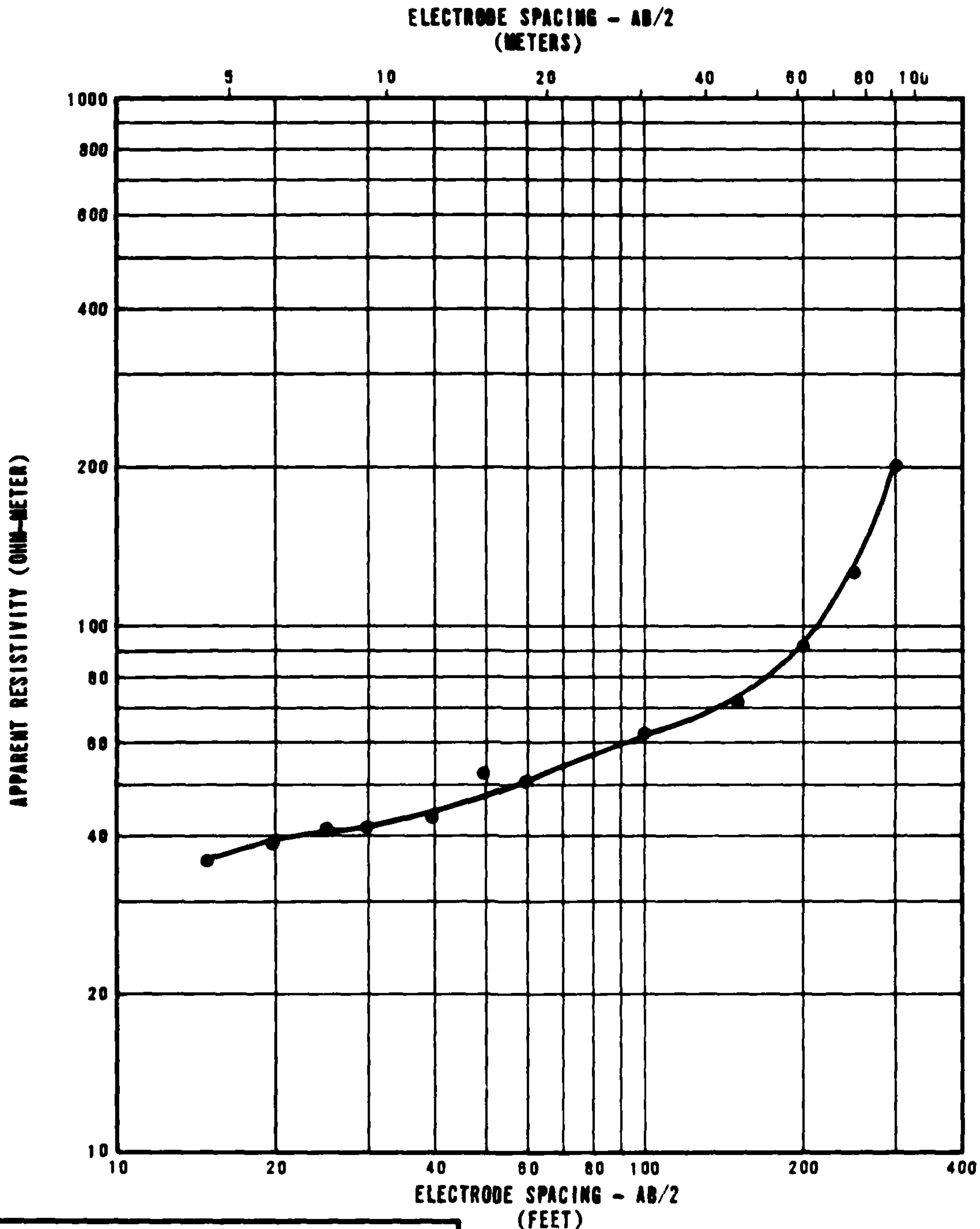
INTERPRETED MODEL		
LAYER DEPTH		RESISTIVITY VALUES
FEET	METERS	OHM-METER
0	0	70
8	2	25
62	19	730

RESISTIVITY SOUNDING WA-R-7
SOUNDING CURVE AND INTERPRETATION
WAH WAH VALLEY, UTAH

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE BMO

FIGURE II-4-7

FUGRO NATIONAL, INC.



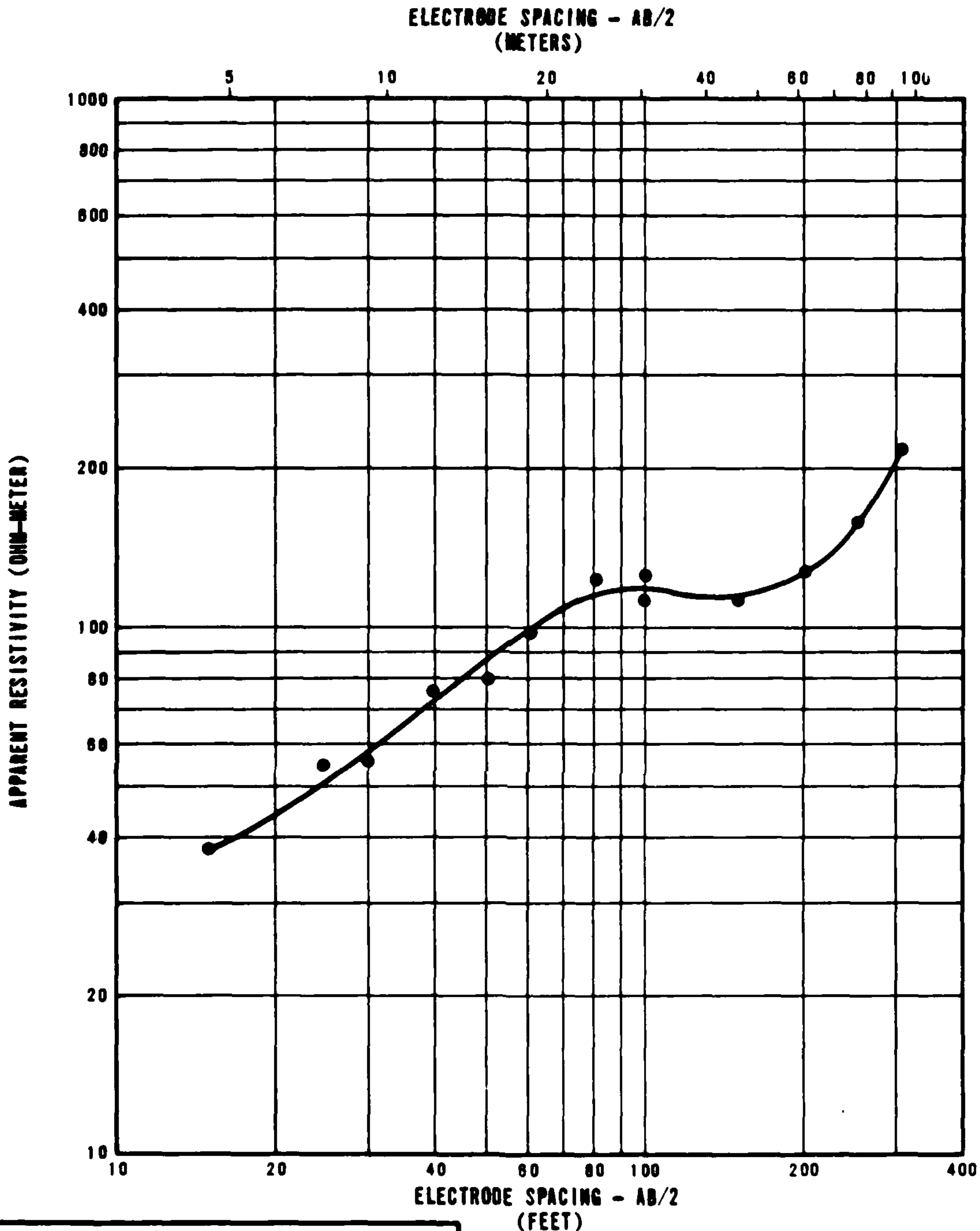
INTERPRETED MODEL		
LAYER DEPTH		RESISTIVITY VALUES
FEET	METERS	OHM-METER
0	0	30
18	5	50
34	10	80
112	34	300

RESISTIVITY SOUNDING WA-R-8
SOUNDING CURVE AND INTERPRETATION
WAH WAH VALLEY, UTAH

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - BMO

FIGURE II-4-8

FUGRO NATIONAL, INC.



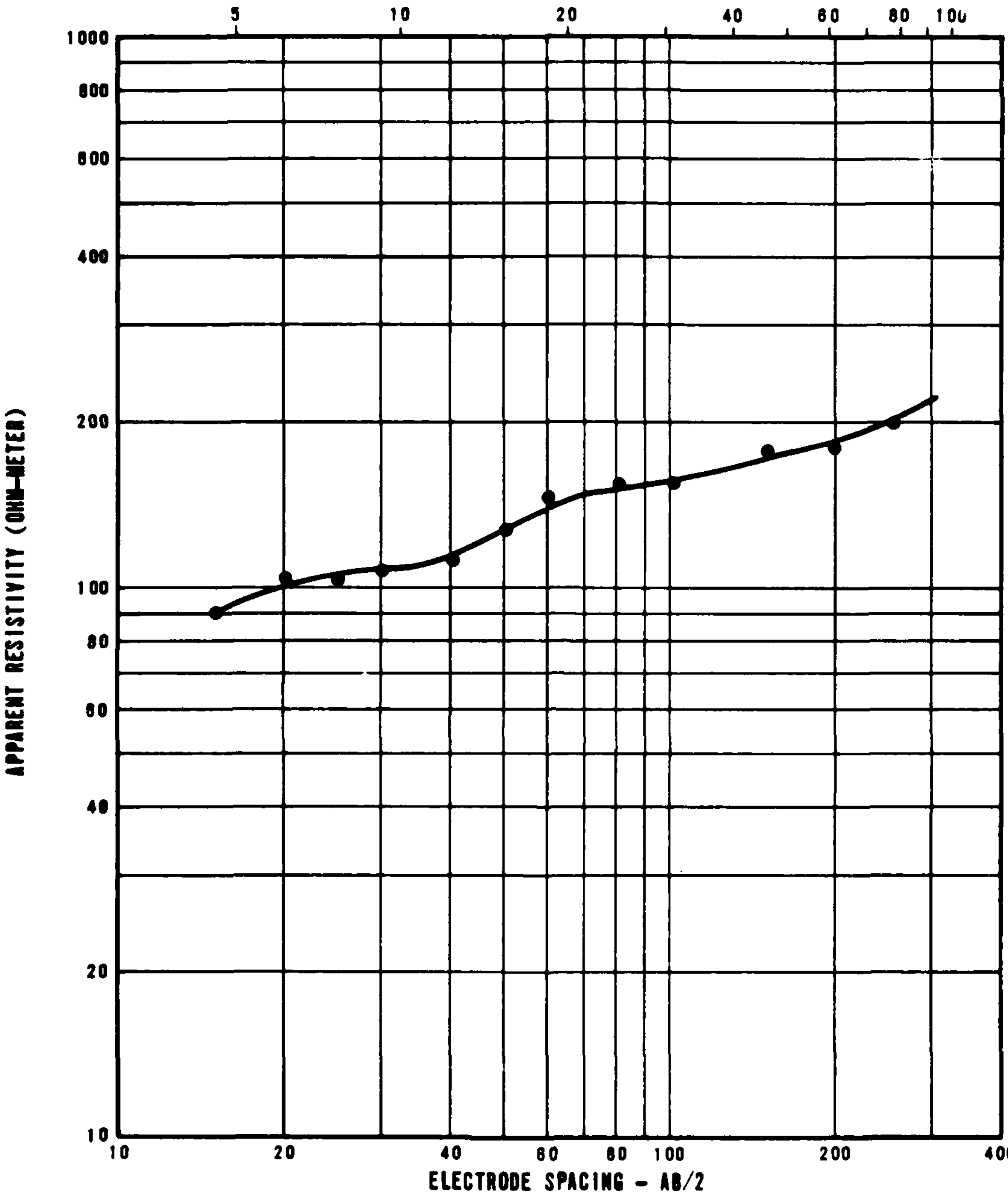
INTERPRETED MODEL		
LAYER DEPTH		RESISTIVITY VALUES
FEET	METERS	OHM-METER
0	0	30
8	2	140
25	8	800
29	9	300
36	11	70

RESISTIVITY SOUNDING WA-R-9
SOUNDING CURVE AND INTERPRETATION
WAH WAH VALLEY, UTAH

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - BMO

FIGURE II-4-9

FUGRO NATIONAL, INC.



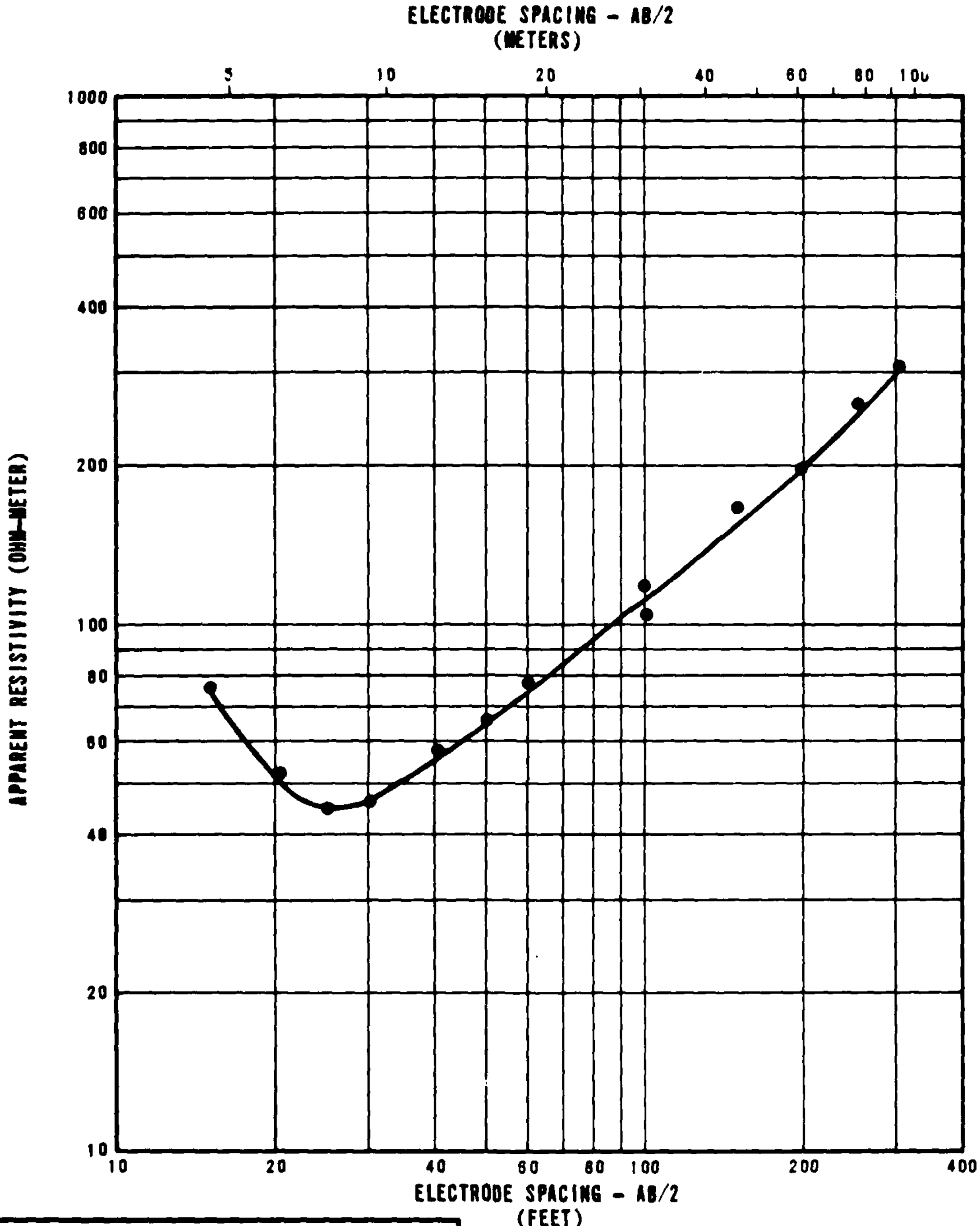
INTERPRETED MODEL		
LAYER DEPTH		RESISTIVITY VALUES
FEET	METERS	OHM-METER
0	0	65
5	2	130
17	5	60
27	8	1180
34	10	150
170	52	1000

RESISTIVITY SOUNDING WA-R-10
SOUNDING CURVE AND INTERPRETATION
WAH WAH VALLEY, UTAH

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - BMO

FIGURE II-4-10

FUGRO NATIONAL, INC.



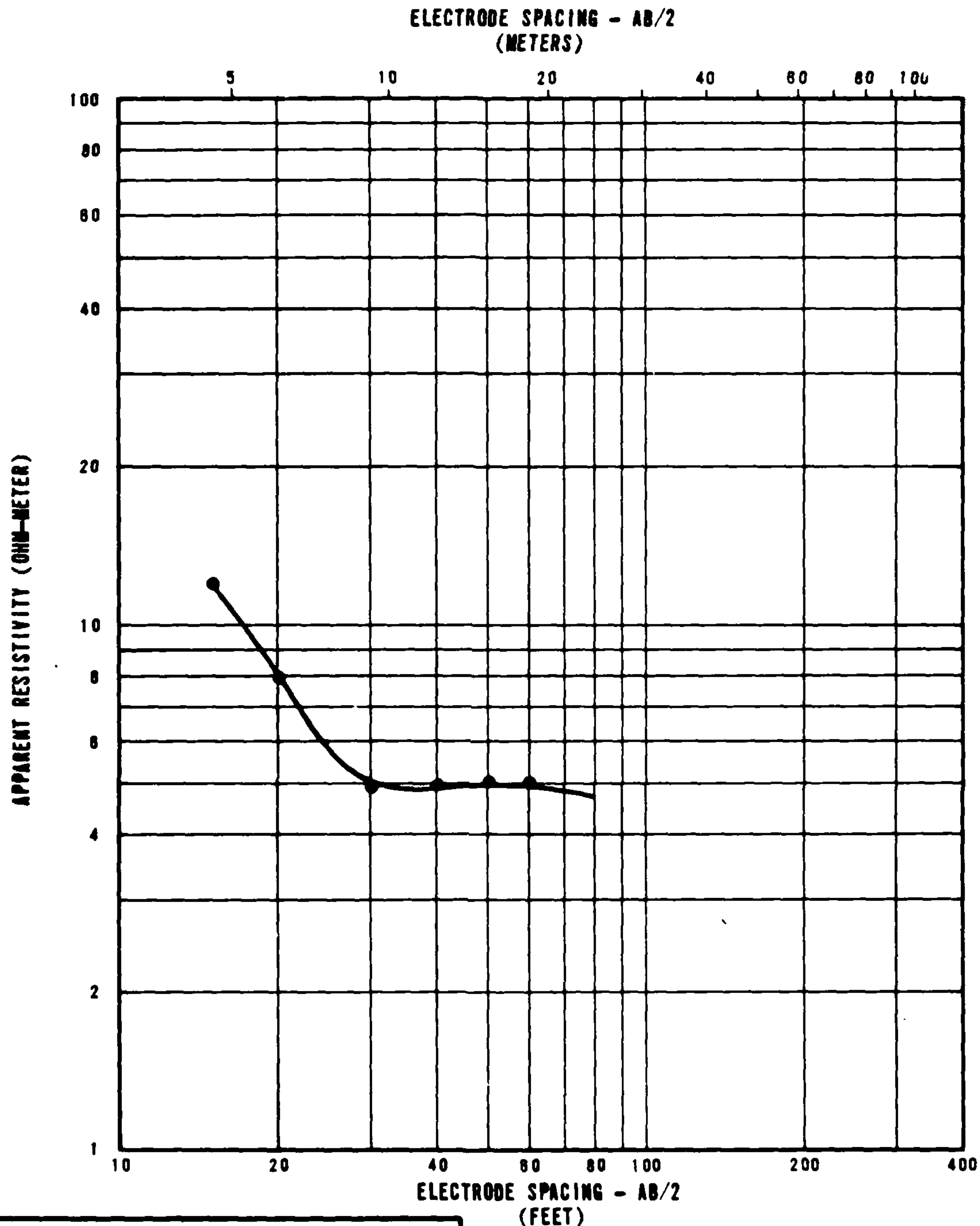
INTERPRETED MODEL		
LAYER DEPTH		RESISTIVITY VALUES
FEET	METERS	OHM-METER
0	0	130
6	2	50
27	8	180
56	17	600
92	28	1750

RESISTIVITY SOUNDING WA-R-1
SOUNDING CURVE AND INTERPRETATION
WAH WAH VALLEY, UTAH

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - BMO

FIGURE II-4-11

FUGRO NATIONAL, INC.



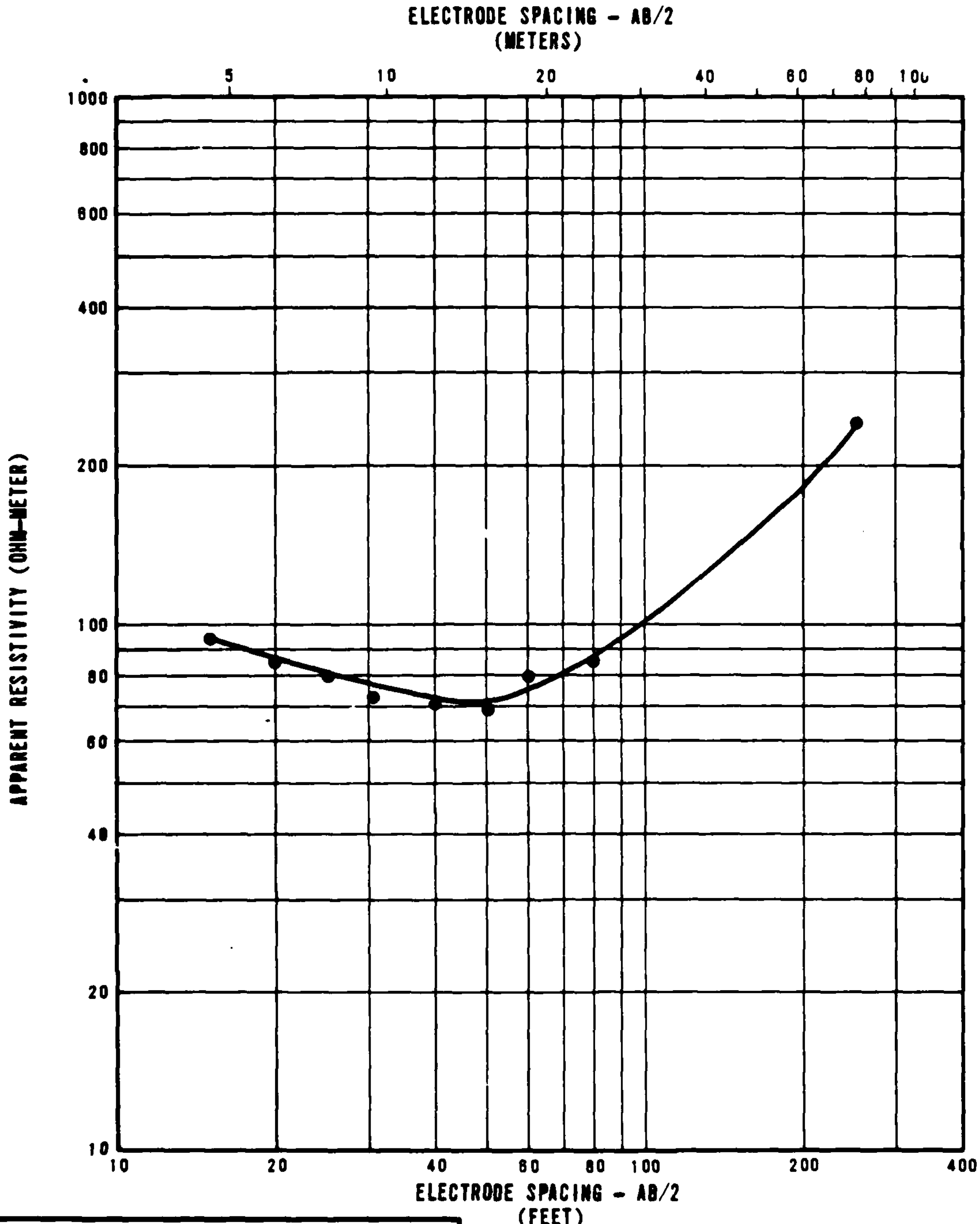
INTERPRETED MODEL		
LAYER DEPTH		RESISTIVITY VALUES
FEET	METERS	OHM-METER
0	0	11
9	3	4

RESISTIVITY SOUNDING WA-R-12
SOUNDING CURVE AND INTERPRETATION
WAH WAH VALLEY, UTAH

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - BMO

FIGURE II-4-12

FUGRO NATIONAL, INC.



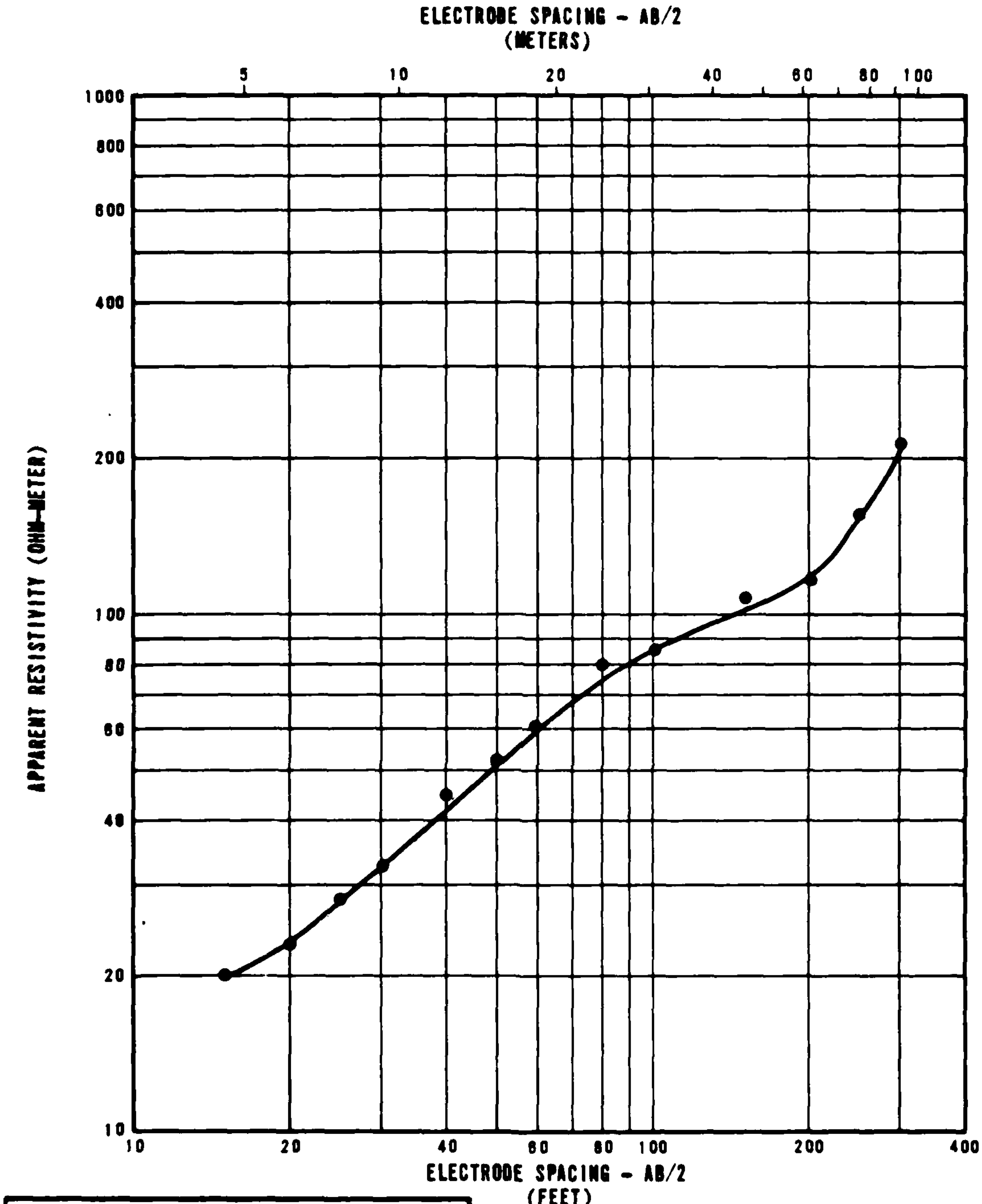
INTERPRETED MODEL		
LAYER DEPTH		RESISTIVITY VALUES
FEET	METERS	OHM-METER
0	0	75
56	17	350
122	37	1450

RESISTIVITY SOUNDING WA-R-13
SOUNDING CURVE AND INTERPRETATION
WAH WAH VALLEY, UTAH

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - BMO

FIGURE
II-4-13

FUGRO NATIONAL, INC.



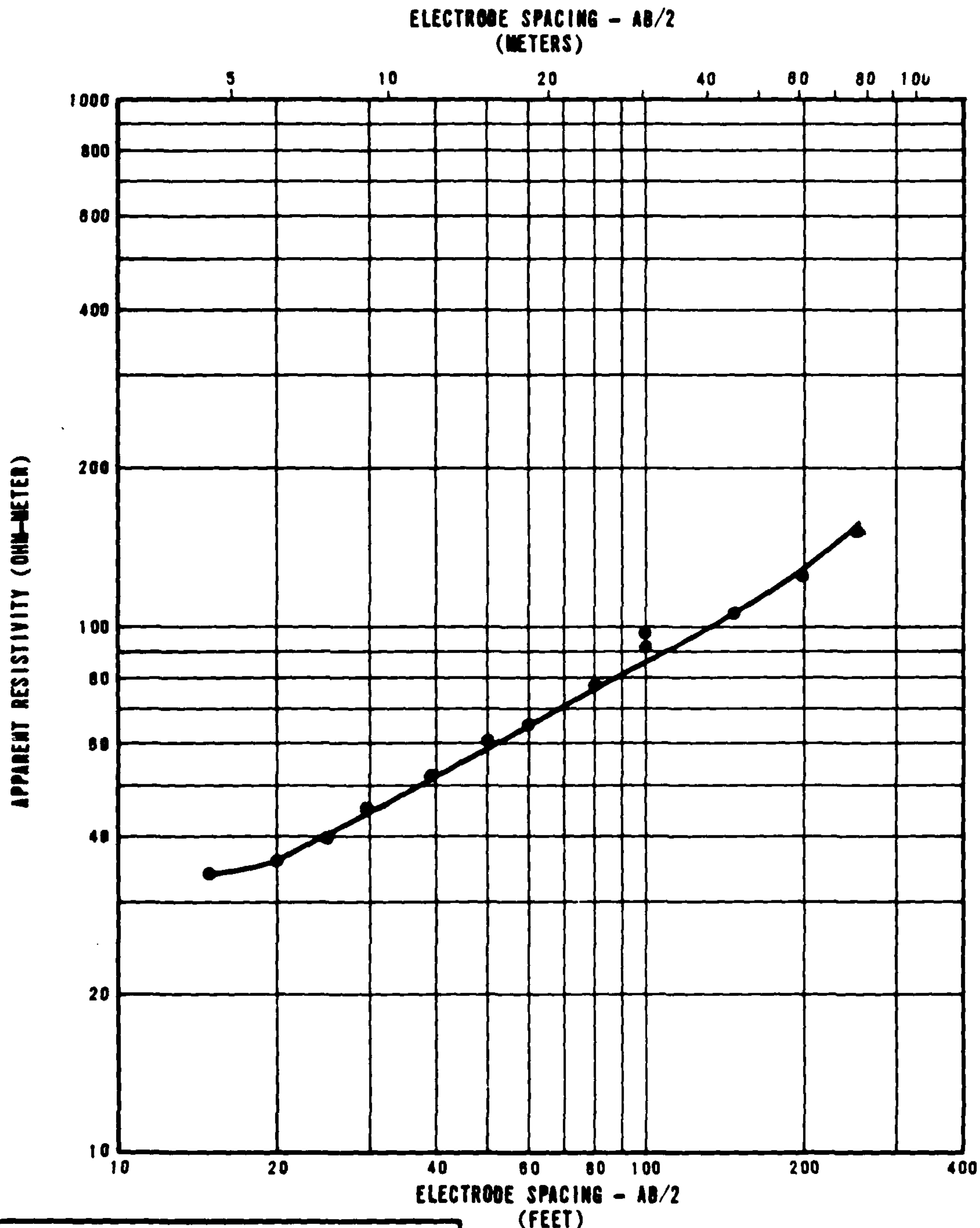
INTERPRETED MODEL		
LAYER DEPTH		RESISTIVITY VALUES
FEET	METERS	OHM-METER
0	0	30
16	5	100
84	26	170

RESISTIVITY SOUNDING WA-R-14
SOUNDING CURVE AND INTERPRETATION
WAH WAH VALLEY, UTAH

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - BMO

FIGURE
II-4-14

FUGRO NATIONAL, INC.



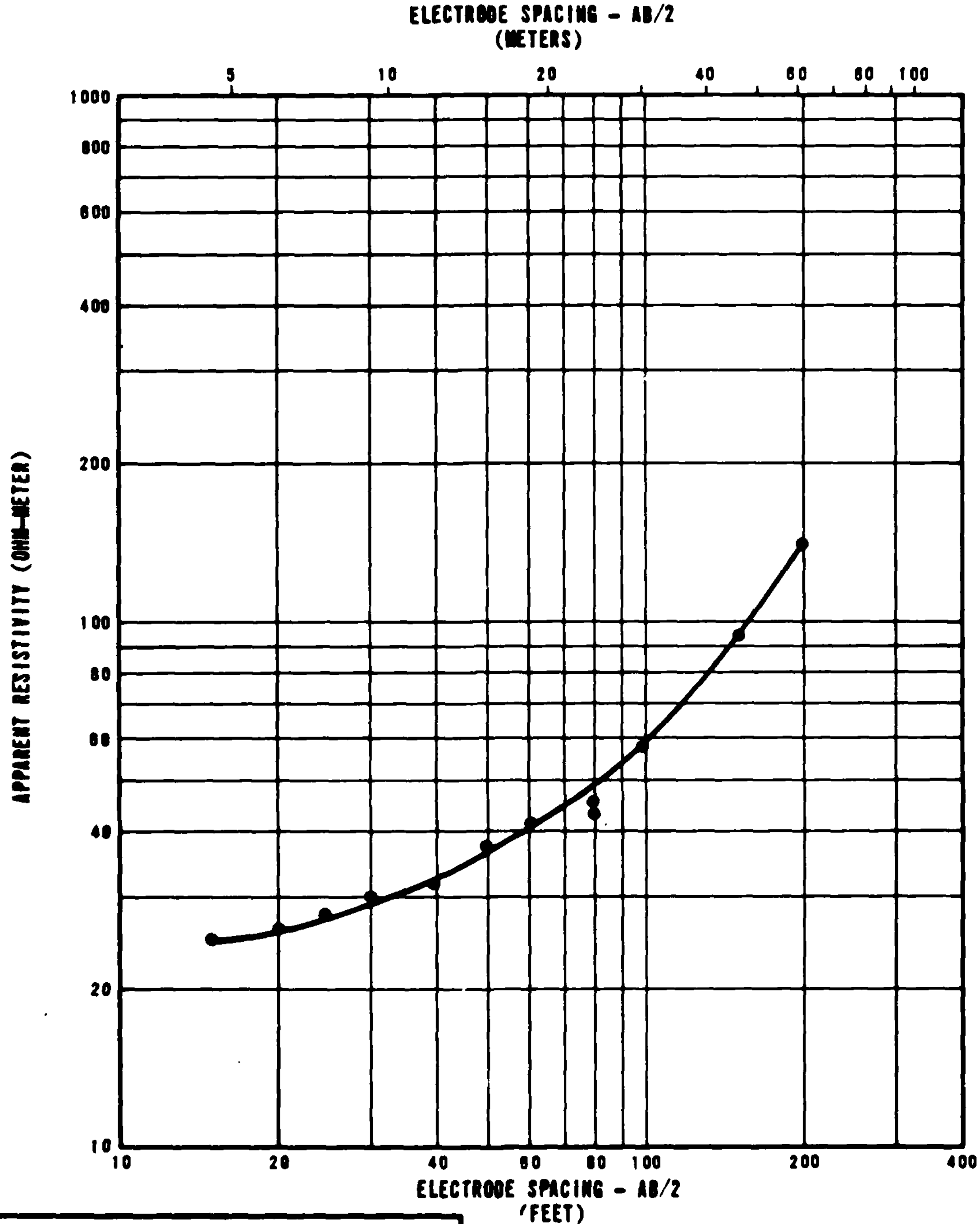
INTERPRETED MODEL		
LAYER DEPTH		RESISTIVITY VALUES
FEET	METERS	OHM-METER
0	0	16
14	4	140
54	16	75
74	23	160
133	41	1900

RESISTIVITY SOUNDING WA-R-15
SOUNDING CURVE AND INTERPRETATION
WAH WAH VALLEY, UTAH

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - BMO

FIGURE
II-4-15

FUGRO NATIONAL, INC.



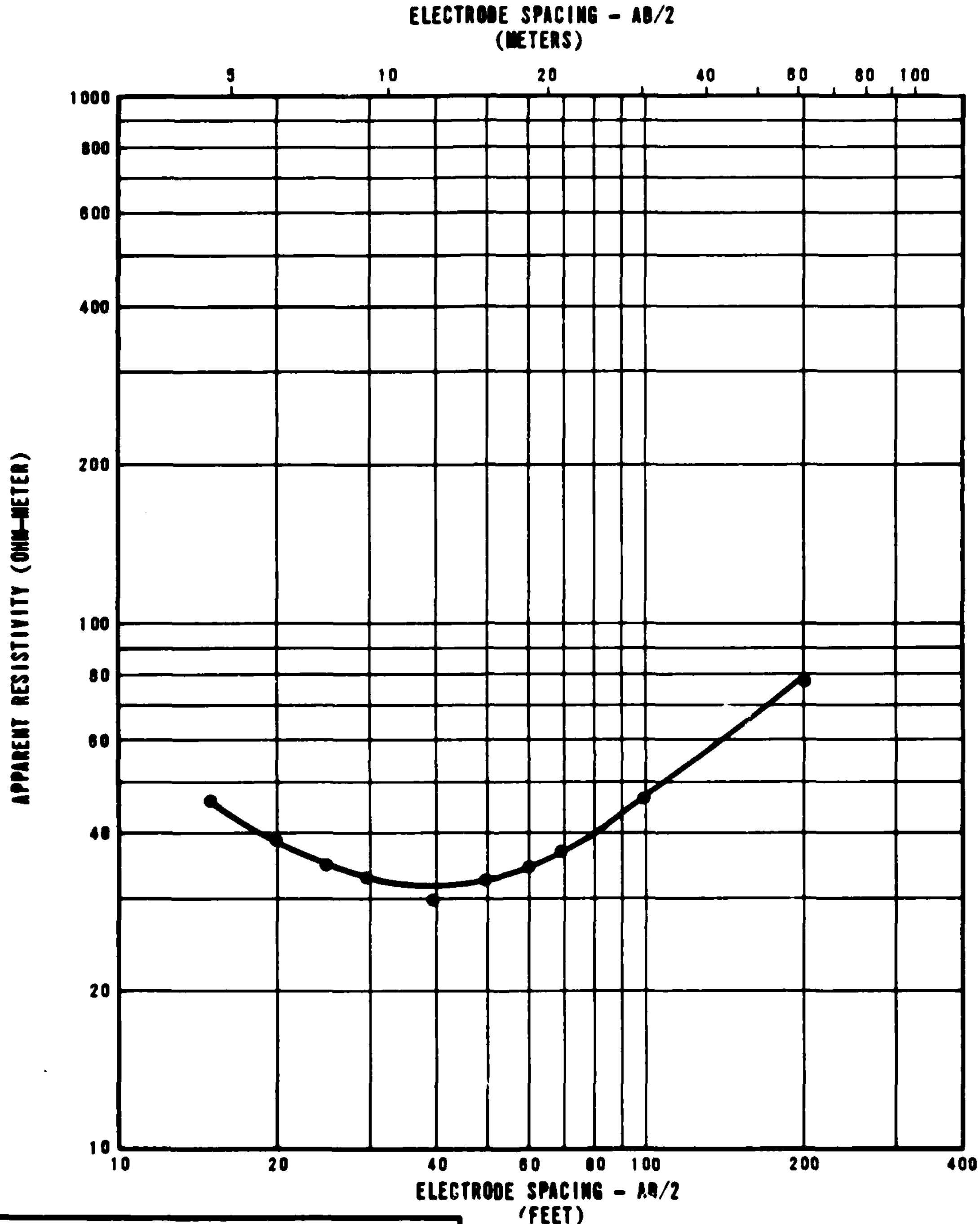
INTERPRETED MODEL		
LAYER DEPTH		RESISTIVITY VALUES
FEET	METERS	OHM-METER
0	0	25
24	7	100
85	26	2000

RESISTIVITY SOUNDING WA-R-16
SOUNDING CURVE AND INTERPRETATION
WAH WAH VALLEY, UTAH

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - BMO

FIGURE
II-4-16

FUGRO NATIONAL, INC.



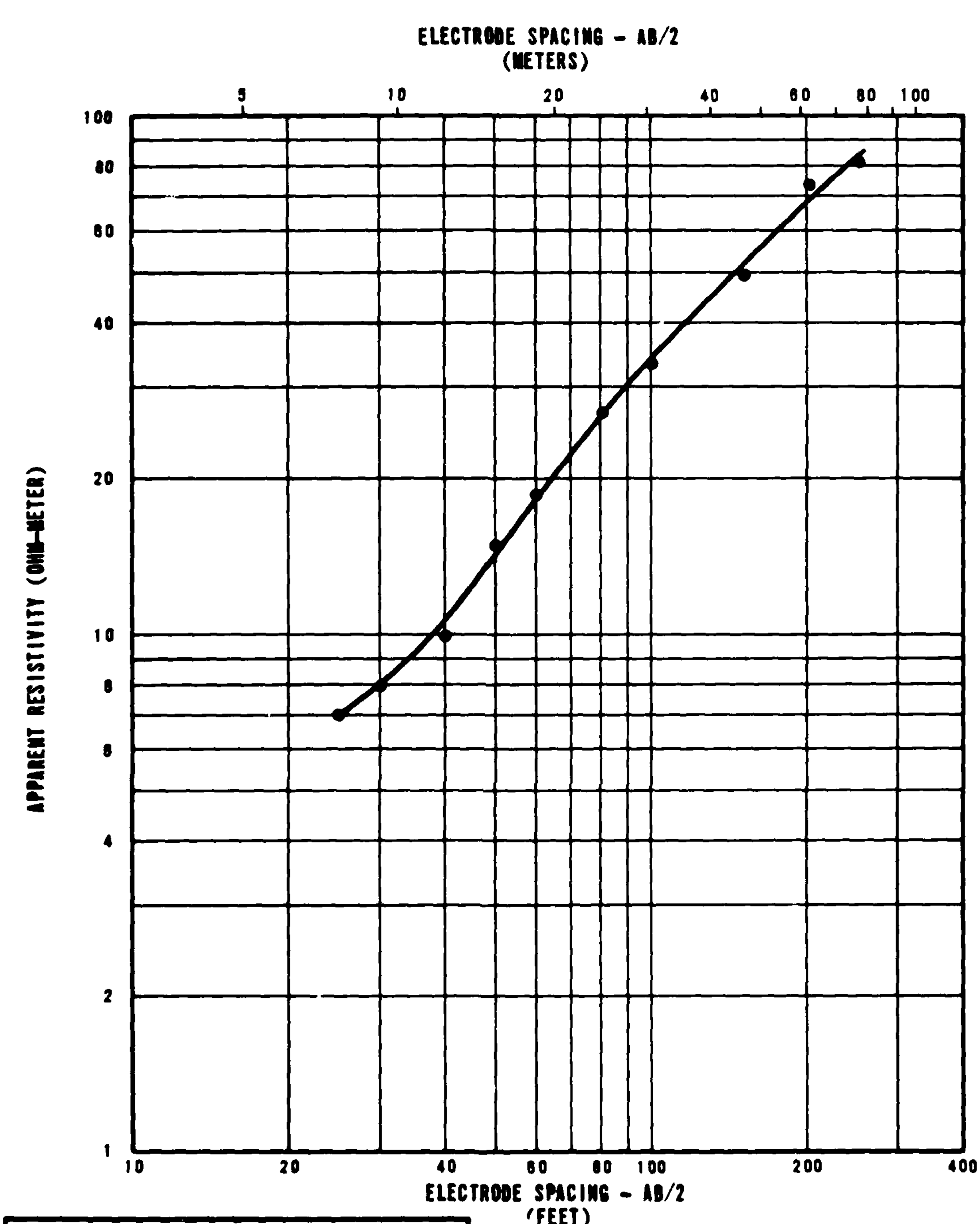
INTERPRETED MODEL		
LAYER DEPTH		RESISTIVITY VALUES
FEET	METERS	OHM-METER
0	0	60
7	2	30
40	15	100

RESISTIVITY SOUNDING WA-R-17
SOUNDING CURVE AND INTERPRETATION
WAH WAH VALLEY, UTAH

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - BMO

FIGURE
II-4-17

FUGRO NATIONAL, INC.



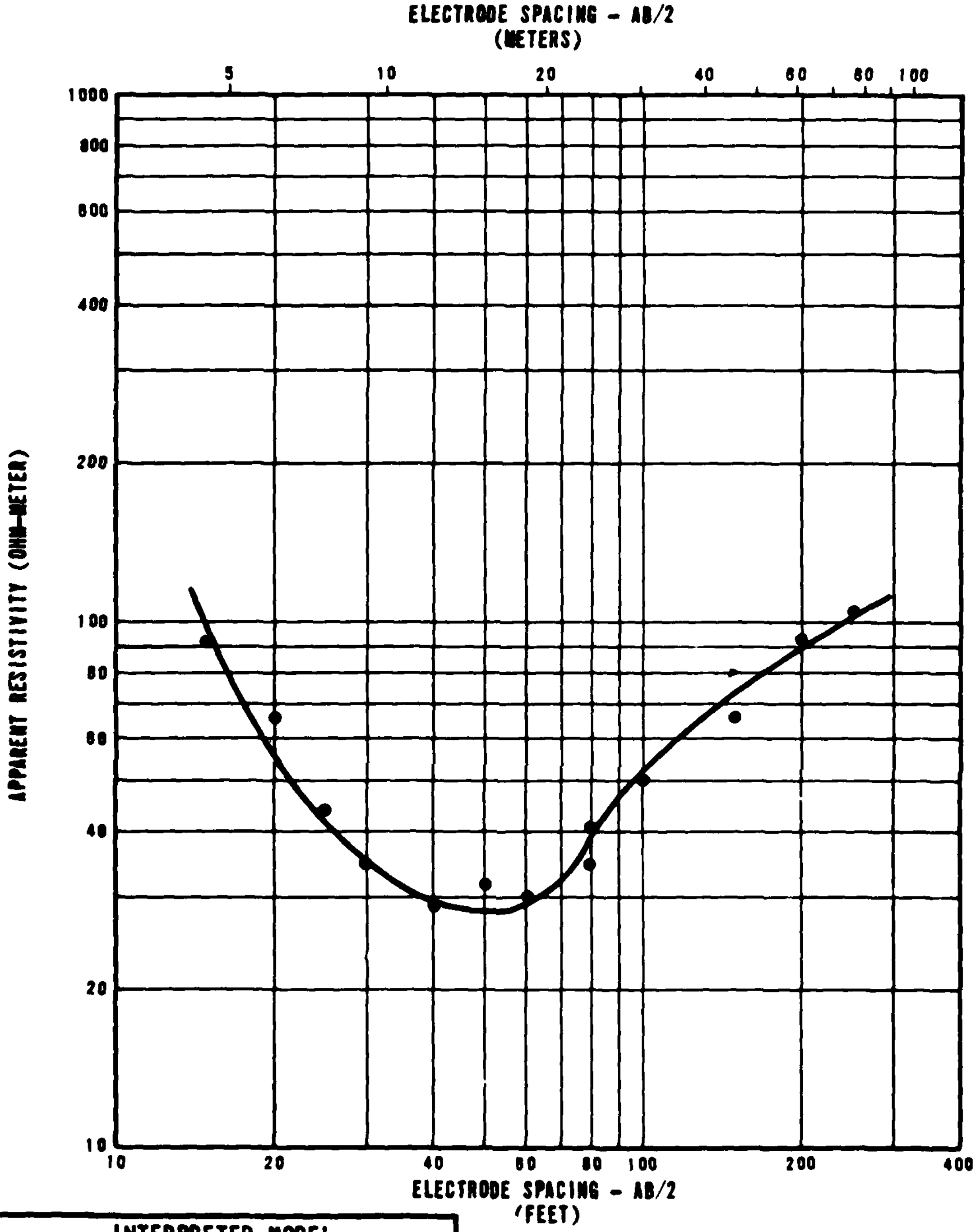
INTERPRETED MODEL		
LAYER DEPTH		RESISTIVITY VALUES
FEET	METERS	OHM-METER
0	0	6
10	3	25
24	7	100
32	10	340

RESISTIVITY SOUNDING WA-R-15
SOUNDING CURVE AND INTERPRETATION
WAH WAH VALLEY, UTAH

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - BMO

FIGURE
II-4-18

FUGRO NATIONAL, INC.



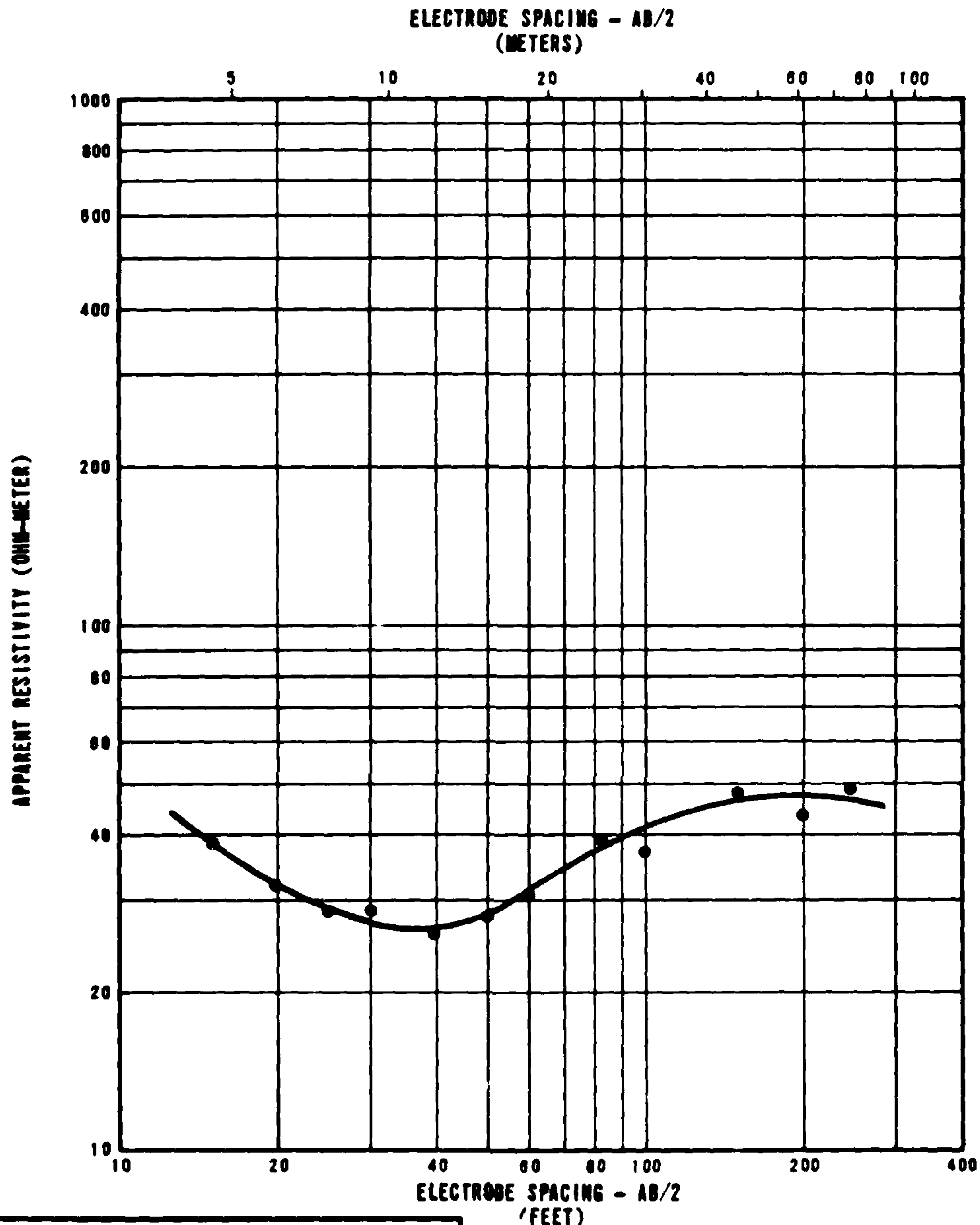
INTERPRETED MODEL		
LAYER DEPTH		RESISTIVITY VALUES
FEET	METERS	OHM-METER
0	0	95
11	3	25
18	5	12
43	13	200

RESISTIVITY SOUNDING WA-R-[illegible]
SOUNDING CURVE AND INTERPRETATION
WAH WAH VALLEY, UTAH

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE [illegible]

FIGURE
II-4-19

FUGRO NATIONAL, INC.



INTERPRETED MODEL		
LAYER DEPTH		RESISTIVITY VALUES
FEET	METERS	OHM-METER
0	0	50
8	2	26
40	12	210
50	16	75
104	32	30

RESISTIVITY SOUNDING WA-R-20
SOUNDING CURVE AND INTERPRETATION
WAH WAH VALLEY, UTAH

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE BMO

FIGURE
II-4-20

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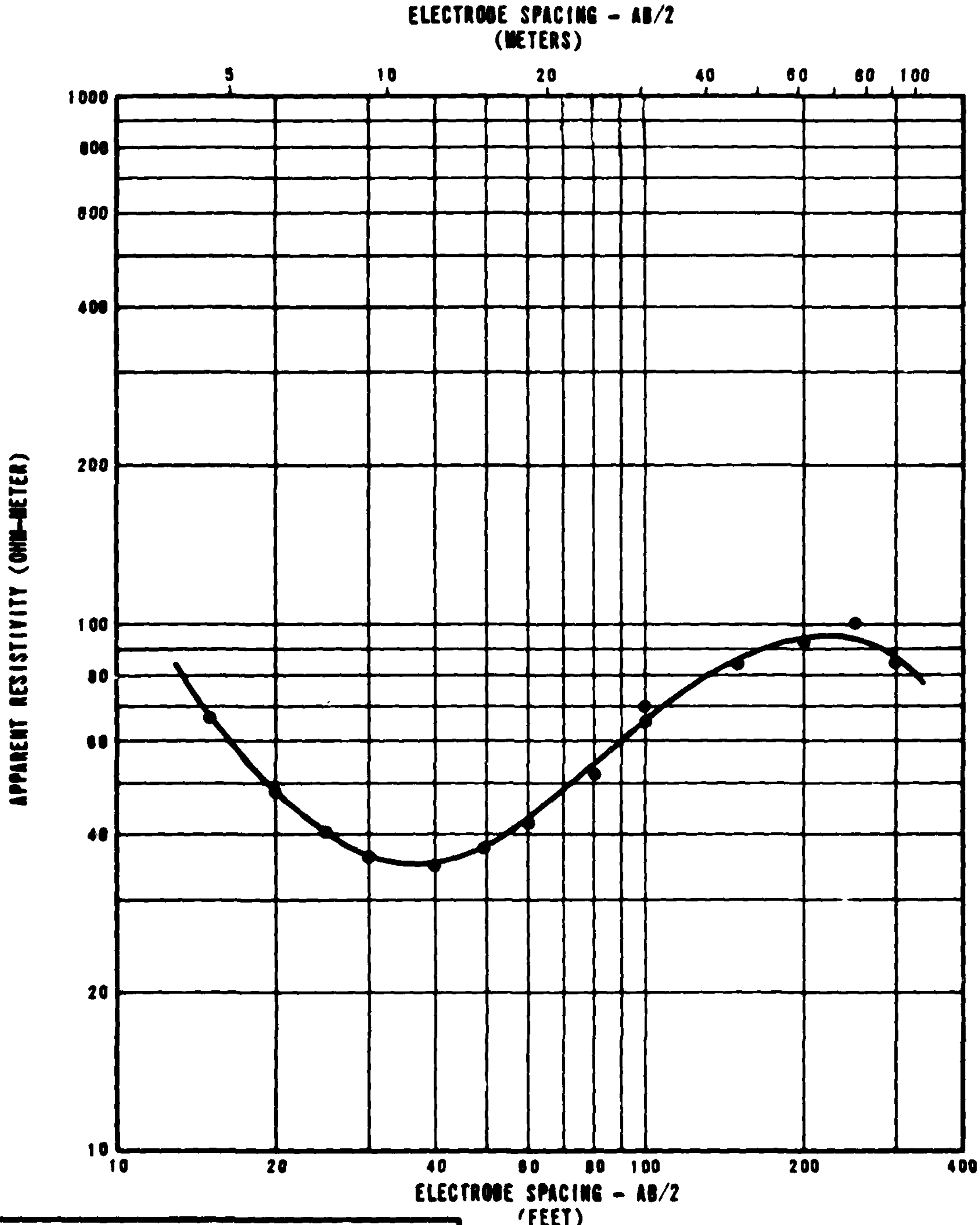

INTERPRETED MODEL		
LAYER DEPTH		RESISTIVITY VALUES
FEET	METERS	OHM-METER
0	0	100
8	2	30
15	5	13
26	8	240
115	35	56

RESISTIVITY SOUNDING WA-R-21
SOUNDING CURVE AND INTERPRETATION
WAH WAH VALLEY, UTAH

MX SITING INVESTIGATION
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FIGURE II-4-21

FUGRO NATIONAL, INC.

5.0 BORING AND TRENCH LOGS

Explanation: All data from borings, trenches and test pits are presented on standard Fugro National logs in Sections 5.0 and 6.0. Explanations of the column headings on the logs are as follows:

A. Designations - Borings, trenches, and test pits are identified as follows:

WA-B-1
WA - abbreviation for the site (e.g., WA-Wah Wah)
B - abbreviation for activity (e.g., B-boring, T-trench) P-test pit)
1 - number of activity

B. Sample Type - Different sampling techniques were used and the symbols are explained at the bottom of the boring logs. For details of sampling techniques, see Section A5.0 of Appendix A in Volume I. Horizontal lines, to scale, indicate the depth where sampling was attempted.

C. Percent Recovery - The numbers shown represent the ratio (in percent) of the soil sample recovered in the sampler to the full penetration of the sampler.

D. N Value - Corresponds to standard penetration resistance, which is number of blows required to drive a standard split-spoon sampler for the second and third of three 6-inch (15-cm) increments with a 140-pound (63.5-kg) hammer falling 30 inches (76 cm) (ASTM D 1586-67).

E. Depth - Corresponds to depth below ground surface in meters and feet.

F. Lithology - Graphic representation of the soil and rock types.

G. USCS - Unified Soil Classification System (see Table II-5-1 for complete details) symbols.

H. Soil Description - Except in cases where samples were classified based on laboratory test data, the descriptions are based on visual classification. The procedures outlined in ASTM D 2487-69, Classification of Soils for Engineering Purposes, and D 2488-69, Description of Soils (Visual-Manual Procedure) were followed. Solid lines across the column indicate known change in strata at the depth shown.

Definitions of some of the terms and criteria to describe soils and conditions encountered during the exploration follow.

Gradation : A coarse-grained soil is well-graded if it has a wide range in grain size and substantial amounts of most intermediate particle sizes.

Poorly graded indicates that the soil consists predominantly of one size (uniformly graded) or has a wide range of sizes with some intermediate sizes obviously missing (gap-graded).

Moisture :	Dry	- no feel of moisture
	Slightly Moist	- much less than normal moisture
	Moist	- normal moisture for soil
	Very Moist	- much greater than normal moisture
	Wet	- for soils below the water table

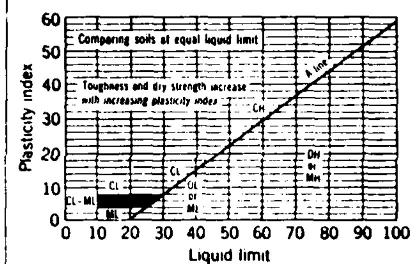
Major Divisions		Field Identification Procedures (Excluding particles larger than 3 in. and basing fractions on estimated weights)	Group Symbols[a]	Typical Names	Information Required for Describing Soils	Laboratory Classification Criteria
Coarse-grained soils More than half of material is *larger* than No. 200 sieve size[b] (The No. 200 sieve size is about the smallest particle visible to naked eye) — Gravels: More than half of coarse fraction is larger than No. 4 sieve size (For visual classification, the ¼ in. size may be used as equivalent to the No. 4 sieve size)	Clean gravels (little or no fines)	Wide range in grain size and substantial amounts of all intermediate particle sizes	*GW*	Well graded gravels, gravel-sand mixtures, little or no fines	Give typical name; indicate approximate percentages of sand and gravel, maximum size; angularity, surface condition, and hardness of the coarse grains; local or geologic name and other pertinent descriptive information; and symbols in parentheses	$C_U = \frac{D_{60}}{D_{10}}$ Greater than 4; $C_C = \frac{(D_{30})^2}{D_{10} \times D_{60}}$ Between 1 and 3
	Clean gravels	Predominantly one size or a range of sizes with some intermediate sizes missing	*GP*	Poorly graded gravels, gravel-sand mixtures, little or no fines		Not meeting all gradation requirements for *GW*
	Gravels with fines (appreciable amount of fines)	Nonplastic fines (for identification procedures see *ML* below)	*GM*	Silty gravels, poorly graded gravel-sand-silt mixtures		Atterberg limits below "A" line, or *PI* less than 4 / Above "A" line with *PI* between 4 and 7 are *borderline* cases requiring use of dual symbols
	Gravels with fines	Plastic fines (for identification procedures, see *CL* below)	*GC*	Clayey gravels, poorly graded gravel-sand-clay mixtures	For undisturbed soils add information on stratification, degree of compactness, cementation, moisture conditions and drainage characteristics	Atterberg limits above "A" line, with *PI* greater than 7
Sands: More than half of coarse fraction is smaller than No. 4 sieve size	Clean sands (little or no fines)	Wide range in grain sizes and substantial amounts of all intermediate particle sizes	*SW*	Well graded sands, gravelly sands, little or no fines	Example: *Silty sand*, gravelly; about 20% *hard, angular gravel particles* ½-in. maximum size; rounded and subangular sand grains coarse to fine, about 15% non-*plastic fines with low dry strength*; well compacted and moist in place, alluvial sand; (*SM*)	$C_U = \frac{D_{60}}{D_{10}}$ Greater than 6; $C_C = \frac{(D_{30})^2}{D_{10} \times D_{60}}$ Between 1 and 3
	Clean sands	Predominantly one size or a range of sizes with some intermediate sizes missing	*SP*	Poorly graded sands, gravelly sands, little or no fines		Not meeting all gradation requirements for *SW*
	Sands with fines (appreciable amount of fines)	Nonplastic fines (for identification procedures, see *ML* below)	*SM*	Silty sands, poorly graded sand-silt mixtures		Atterberg limits below "A" line or *PI* less than 5 / Above "A" line with *PI* between 4 and 7 are *borderline* cases requiring use of dual symbols
	Sands with fines	Plastic fines (for identification procedures, see *CL* below)	*SC*	Clayey sands, poorly graded sand-clay mixtures		Atterberg limits below "A" line with *PI* greater than 7

Laboratory classification criteria (common to the coarse-grained soils): Determine percentages of gravel and sand from grain size curve. Depending on percentage of fines (fraction smaller than No. 200 sieve size) coarse grained soils are classified as follows: Less than 5% *GW, GP, SW, SP*; More than 12% *GM, GC, SM, SC*; 5% to 12% *Borderline* cases requiring use of dual symbols.

Use grain size curve in identifying the fractions as given under field identification.

Identification Procedures on Fraction Smaller than No. 40 Sieve Size

Major Divisions		Dry Strength (crushing characteristics)	Dilatancy (reaction to shaking)	Toughness (consistency near plastic limit)	Group Symbols[a]	Typical Names	Information Required for Describing Soils
Fine-grained soils More than half of material is *smaller* than No. 200 sieve size	Silts and clays liquid limit less than 50	None to slight	Quick to slow	None	*ML*	Inorganic silts and very fine sands, rock flour, silty or clayey fine sands with slight plasticity	Give typical name; indicate degree and character of plasticity, amount and maximum size of coarse grains; colour in wet condition, odour if any, local or geologic name, and other pertinent descriptive information, and symbol in parentheses
		Medium to high	None to very slow	Medium	*CL*	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays	
		Slight to medium	Slow	Slight	*OL*	Organic silts and organic silt-clays of low plasticity	For undisturbed soils add information on structure, stratification, consistency in undisturbed and remoulded states, moisture and drainage conditions
	Silts and clays liquid limit greater than 50	Slight to medium	Slow to none	Slight to medium	*MH*	Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts	
		High to very high	None	High	*CH*	Inorganic clays of high plasticity, fat clays	Example: *Clayey silt*, brown; slightly plastic; small percentage of fine sand; numerous vertical root holes, firm and dry in place; loess; (*ML*)
		Medium to high	None to very slow	Slight to medium	*OH*	Organic clays of medium to high plasticity	
Highly Organic Soils		Readily identified by colour, odour, spongy feel and frequently by fibrous texture			*Pt*	Peat and other highly organic soils	



Plasticity chart
for laboratory classification of fine grained soils

From Wagner, 1957.
[a] *Boundary classifications*. Soils possessing characteristics of two groups are designated by combinations of group symbols. For example *GW-GC*, well graded gravel-sand mixture with clay binder.
[b] All sieve sizes on this chart are U.S. standard.

Field Identification Procedure for Fine Grained Soils or Fractions

These procedures are to be performed on the minus No. 40 sieve size particles, approximately 1/64 in. For field classification purposes, screening is not intended, simply remove by hand the coarse particles that interfere with the tests.

Dilatancy (Reaction to shaking)
After removing particles larger than No. 40 sieve size, prepare a pat of moist soil with a volume of about one-half cubic inch. Add enough *water if necessary to make the soil soft but not sticky*.
Place the pat in the open palm of one hand and shake horizontally, striking vigorously against the other hand several times. A positive reaction consists of the appearance of water on the surface of the pat which changes to a livery consistency and becomes glossy. When the sample is squeezed between the fingers, the water and gloss disappear from the surface, the pat stiffens and finally it cracks or crumbles. The rapidity of appearance of water during shaking and of its disappearance during squeezing assist in identifying the character of the fines in a soil.
Very fine clean sands give the quickest and most distinct reaction whereas a plastic clay has no reaction. Inorganic silts, such as a typical rock flour, show a moderately quick reaction.

Dry Strength (Crushing characteristics):
After removing particles larger than No. 40 sieve size, mould a pat of soil to the consistency of putty, adding water if necessary. Allow the pat to dry completely by oven, sun or air drying, and then test its strength by breaking and crumbling between the fingers. This strength is a measure of the character and quantity of the colloidal fraction contained in the soil. The dry strength increases with increasing plasticity.
High dry strength is characteristic for clays of the CH group. A typical inorganic silt possesses only very slight dry strength. Silty fine sands and silts have about the same slight dry strength, but can be distinguished by the feel when powdering the dried specimen. Fine sand feels gritty whereas a typical silt has the smooth feel of flour.

Toughness (Consistency near plastic limit):
After removing particles larger than the No. 40 sieve size, a specimen of soil about one-half inch cube in size, is moulded to the consistency of putty. If too dry, water must be added and if sticky, the specimen should be spread out in a thin layer and allowed to lose some moisture by evaporation. Then the specimen is rolled out by hand on a smooth surface or between the palms into a thread about one-eight inch in diameter. The thread is then folded and re-rolled repeatedly. During this manipulation the moisture content is gradually reduced and the specimen stiffens, finally loses its plasticity, and crumbles when the plastic limit is reached.
After the thread crumbles, the pieces should be lumped together and a slight kneading action continued until the lump crumbles.
The tougher the thread near the plastic limit and the stiffer the lump when it finally crumbles, the more potent is the colloidal clay fraction in the soil. Weakness of the thread at the plastic limit and quick loss of *coherence of the lump below the plastic limit indicate either inorganic* clay of low plasticity, or materials such as kaolin-type clays and organic clays which occur below the A-line.
Highly organic clays have a very weak and spongy feel at the plastic limit.

UNIFIED SOIL CLASSIFICATION SYSTEM

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - SAMSO

TABLE
II-5-1

FUGRO NATIONAL, INC.

Consistency: Consistency descriptions of coarse-grained soils (GW, GP, GM, GC, SW, SP, SM, SC) are as follows.

Consistency	N Value (ASTM D 1586-67)
Very Loose	0 - 4
Loose	4 - 10
Medium Dense	10 - 30
Dense	30 - 50
Very Dense	>50

Consistency descriptions of fine-grained soils (ML, CL, MH, CH,) are as follows:

Consistency	Shear Strength (ksf)	Shear Strength (kN/m^2)	Field Guide
Very Soft	0.25	12	Sample with height equal to twice the diameter, sags under own weight
Soft	0.25-0.50	12 - 24	Can be squeezed between thumb and forefinger
Firm	0.50-1.00	24-48	Can be molded easily with fingers
Stiff	1.00-2.00	48-96	Can be imprinted with slight pressure from fingers
Very Stiff	2.00-4.00	96-192	Can be imprinted with considerable pressure from fingers
Hard	over 4.00	over 192	Cannot be imprinted by fingers

Grain Shape: Angular - particles have sharp edges and relatively plane sides with unpolished surfaces.

Subangular - particles are similar to angular but have somewhat rounded edges.

Subrounded - particles exhibit nearly plane sides but have well-rounded corners and edges.

Rounded - particles have smoothly curved sides and no edges.

Calcareous : Containing calcium carbonate; presence of calcium carbonate is commonly identified on the basis of reaction with dilute hydrochloric acid.

Caliche : Soils cemented by calcium carbonate and/or other soluble minerals by upward-moving solutions.

Degree of Cementation: (Stages of development of caliche profile)

Stage	Gravelly Soils	Nongravelly Soils
I	Thin, discontinuous pebble coatings	Few filaments or faint coatings
II	Continuous pebble coatings, some interpebble fillings	Few to abundant nodules, flakes, filaments
III	Many interpebble fillings	Many nodules and internodular fillings
IV	Laminar horizon overlying plugged horizon	Increasing carbonate impregnation

Secondary Material : Example - Sand with trace to some silt

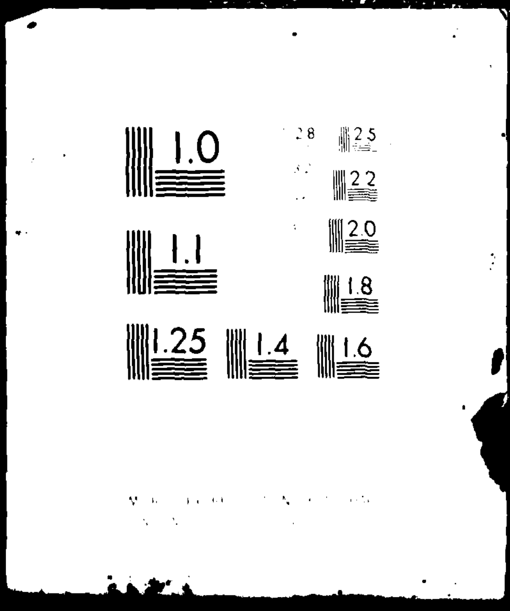
Occasional - 0-4% (by dry weight - for cobbles and boulders)
Trace - 5-12% (by dry weight)
Little - 13-20% (by dry weight)
Some - >20% (by dry weight)

AD-A113 393 FUGRO NATIONAL INC LONG BEACH CA F/G 13/2
VERIFICATION STUDY - WAH WAH VALLEY, UTAH. VOLUME II. GEOTECHNI--ETC(U)
MAR 81 F04704-80-C-0006
UNCLASSIFIED FN-TR-27-WA-VOL-2 NL

2 OF 4
AD A
113393

2 OF 4

AD A
113393



Plasticity : Plasticity index is the range of water content, expressed as a percentage of the weight of the oven-dried soil, through which the soil is plastic. It is defined as the liquid limit minus the plastic limit. Descriptive ranges used on the logs include:

Nonplastic	(PI, 0 - 4)
Slightly Plastic	(PI, 4 - 15)
Medium Plastic	(PI, 15 - 30)
Highly Plastic	(PI, >30)

Cobbles and Boulders : A cobble is a rock fragment, usually rounded by weathering or abrasion, with an average diameter ranging between 3 and 12 inches (8 and 30 cm).

A boulder is a rock fragment, usually rounded by weathering or abrasion, with an average diameter of 12 inches (30 cm) or more.

I. Remarks - This column was provided on boring and trench logs for comments regarding drilling difficulty, number and size of cobbles or boulders encountered, loss of drilling fluid in the boring, trench wall stability, and other conditions encountered during drilling and excavations.

J. Dry Density and Moisture Content - The boring logs include a graphical display of laboratory test results for dry density (ASTM D 2937-71) in pounds per cubic foot and kilograms per cubic meter and moisture content (ASTM D 2216-71) in percent from representative samples taken during drilling. The symbols are explained at the bottom of the boring logs.

K. Sieve Analysis - The numbers represent the percentage by dry weight (ASTM D 422-63) of each of the following soil components:

GR - Gravel, rock particles that will pass a 3-inch (76-mm) sieve and are retained on No. 4 (4.75 mm) sieve.

SA - Sand, soil particles passing No. 4 sieve and retained on No. 200 (0.075 mm) sieve.

FI - Fines, silt or clay, soil particles passing No. 200 sieve.

L. Atterberg Limits (LL and PI) -

LL - Liquid Limit, the water content corresponding to the arbitrary limit between the liquid and plastic states of consistency of a soil (ASTM D 423-66).

PL - Plastic Limit, the water content corresponding to an arbitrary limit between the plastic and the semisolid state of consistency of a soil (ASTM D 424-59).

PI - Plasticity Index, numerical difference between the liquid limit (LL) and the plastic limit (PL) indicating the range of moisture content within which a soil-water mixture is plastic.

NP - Nonplastic.

M. Miscellaneous Information -

Elevations - indicated elevations on the logs are estimated from topographic maps of the study area, within an accuracy of half the contour interval.

Surficial Geologic Unit - indicates the surficial geologic unit in which the activity is located.

Date Drilled - indicates the period from beginning to completion of the activity.

Drilling Method - signifies the type of drilling procedure used such as rotary wash.

Hole Diameter - nominal size of boring drilled.

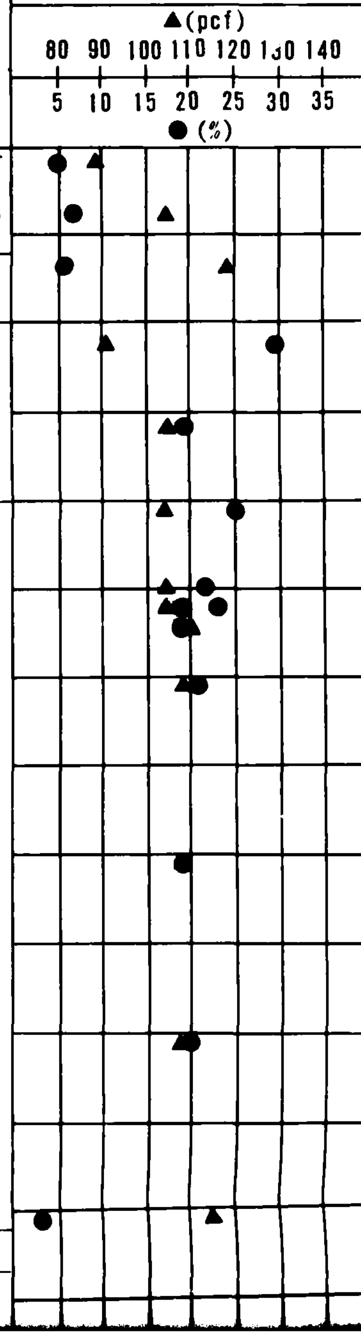
Water Level - indicates depth from ground surface to water table where encountered.

Trench Length - length at ground surface of final trench excavation.

Trench Orientation - bearing of longitudinal trench centerline.

CHECKED BY __________ APPROVED BY __________

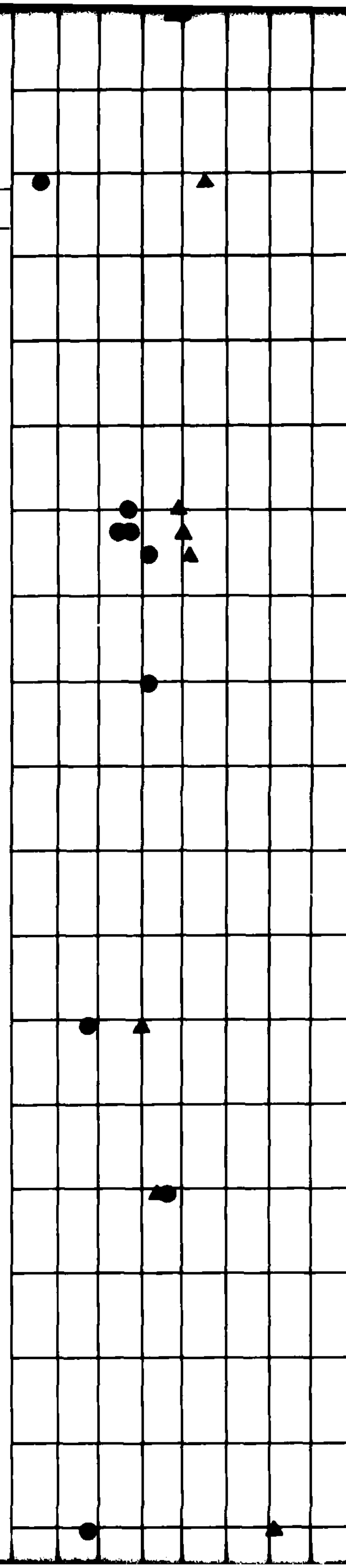
SAMPLE TYPE	% RECOVERY	N VALUE	DEPTH METERS	DEPTH FEET	LITHOLOGY	USCS	SOIL DESCRIPTION	REMARKS
	88, 100, 100	10, 31, 30, 39, 37, 84, 54	0	0		SM	SILTY SAND, brown, fine to coarse, poorly graded, dense, subrounded to rounded, calcareous; some nonplastic silt; trace to little fine gravel.	Continuous SPT (0.0' - 10.5') sample intervals not shown. cementation
	90, 100, 100, 100, 100, 100, 100		3, 6, 9, 12, 15, 18	10, 20, 30, 40, 50, 60		CH	CLAY, gray, stiff to very stiff, highly plastic, calcareous; trace fine sand; sandy gravel (61.0' - 64.0').	loss of drilling fluid (10'-20')
	100					GP		loss of drilling fluid
							SANDY CLAY, gray, very stiff, medium	

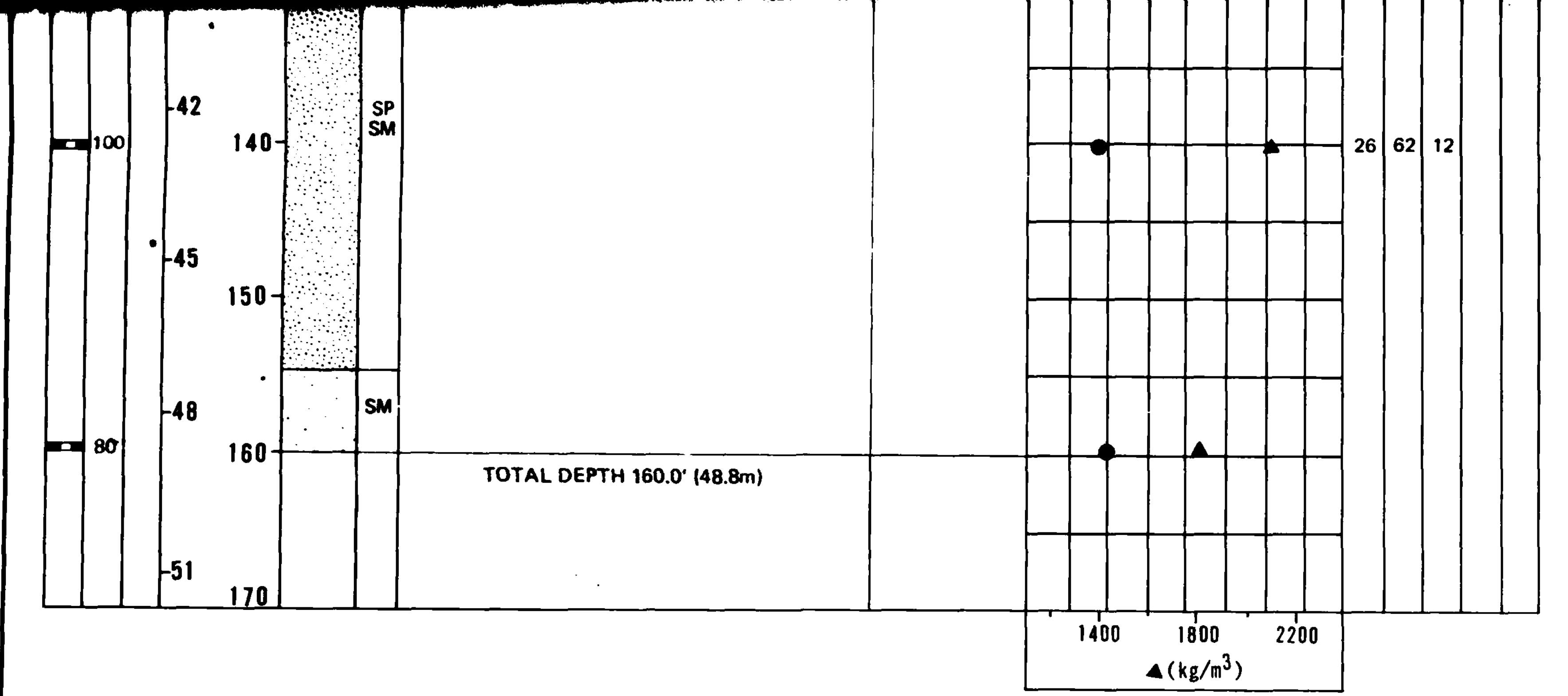


Depth (ft)	SIEVE ANALYSIS GR	SA	FI	LL	PI
0-3	16	59	25		
3-6	5	70	25		
6-9	7	68	25		
10-13	0	9	91	65	44
25-27	0	0	100	64	42
30	0	0	100	67	46

12

Recovery (%)	Elevation	Depth	Symbol	Description	Remarks					
100	-18	60	GP		loss of drilling fluid					
100	-21	70	CH / SM	SANDY CLAY, gray, very stiff, medium plastic, calcareous; some fine subrounded to rounded sand; gravelly sand (70.5' - 73.0').		0 31	21 56	79 13	57	30
			CH							
100	-24	80	SC	CLAYEY SAND, gray, fine to coarse, poorly graded, very dense, subrounded to rounded, calcareous; some slightly plastic clay; trace fine gravel; sandy gravel (84.0' - 98.0').		10	53	37	25	11
100	-27	90	GC			43	34	23	48	29
100	-30	100								
100	-33	110	SC			1	73	26		
100	-36	120								
	-39	130		GRAVELLY SAND, brown, fine to coarse, poorly graded, very dense, subrounded to rounded, calcareous; little to some fine gravel; trace to little silt.						
100	-42	140	SP SM			26	62	12		





EXPLANATION

- FUGRO DRIVE SAMPLE
- BULK SAMPLE
- PITCHER TUBE SAMPLE
- STANDARD PENETRATION TEST SAMPLE
- CORE SAMPLE

N – STANDARD PENETRATION RESISTANCE

▲ – DRY UNIT WEIGHT (ASTM: D–2937–71)

● – MOISTURE CONTENT (ASTM: D–2216–71)

NR – NO RECOVERY

† – TEST LOCATION APPROXIMATELY 5 FEET FROM BORING.

BORING DETAILS

ELEVATION	: 4810' (1466m)
SURFICIAL GEOLOGIC UNIT	: A5i/A4o
DATE DRILLED	: 30 June 1980
DRILLING METHOD	: Rotary Wash
HOLE DIAMETER	: 4 7/8" (124mm)
WATER LEVEL	: Not Encountered

LOG OF BORING WA-B-1
WAH WAH VALLEY, UTAH

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - BMO

FIGURE II-5-1

FUGRO NATIONAL, INC.

AFV-06

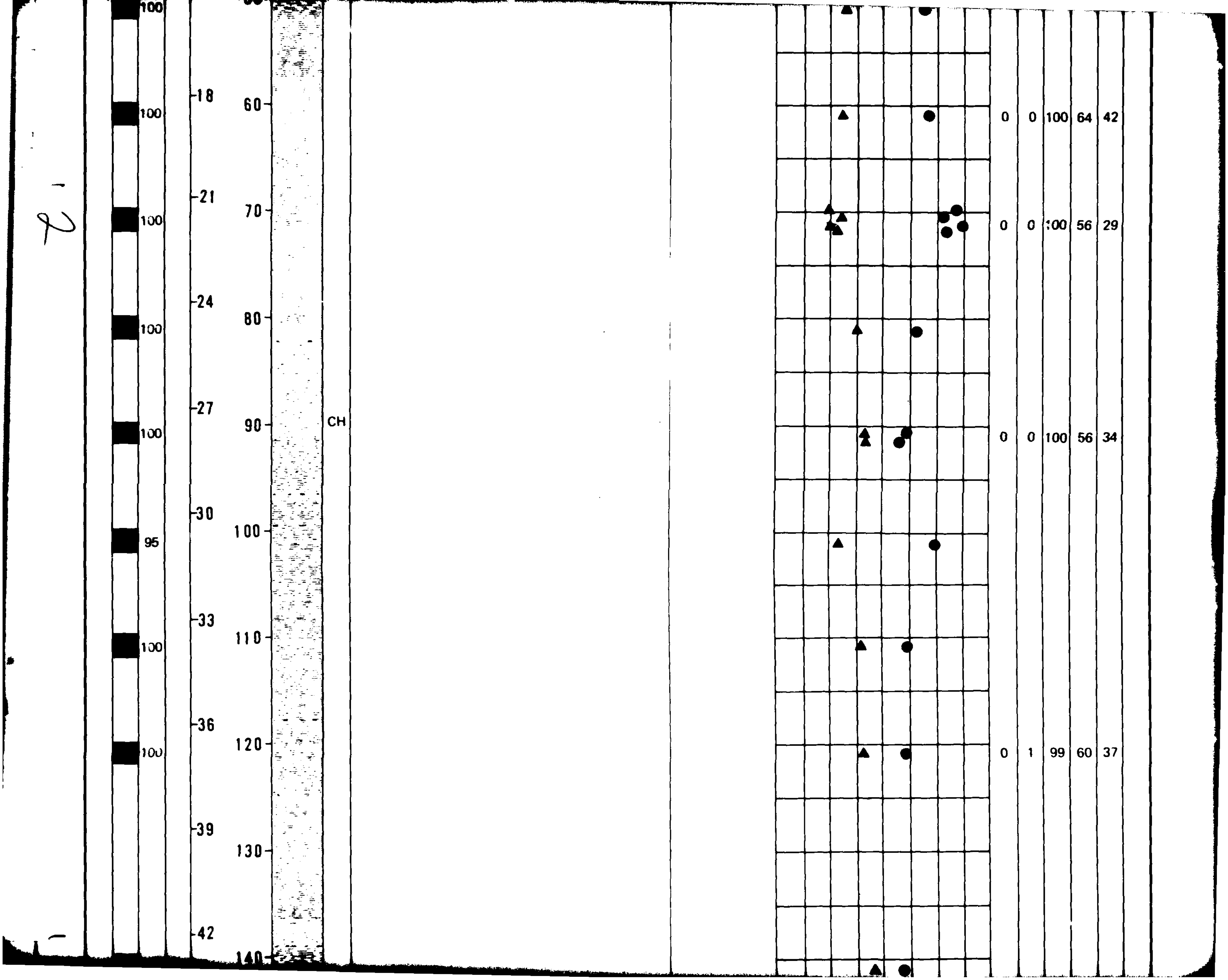
1 3

% RECOVERY	N VALUE ↑	DEPTH METERS	DEPTH FEET	USCS	SOIL DESCRIPTION	REMARKS	SIEVE ANALYSIS GR	SA	FI	LL	PI
72	12	0	0	ML	SANDY SILT, gray, hard, slightly plastic, calcareous; some fine subrounded to rounded sand.	Continuous SPT (0.0' - 10.5') sample intervals not shown	0	25	75	32	5
100	6, 15			MH			0	8	92	57	19
100	19, 30			ML	CLAYEY SILT, gray, hard, medium plastic, calcareous; trace fine sand.		0	4	96	47	17
100	21, 22	3	10								
				SW-SM	GRAVELLY SAND, brown, fine to coarse, well graded, very dense, subrounded to rounded; some fine gravel; trace silt.		45	46	9		
		6	20								
100											
100		9	30		CLAY, gray, very stiff to hard, medium to highly plastic, calcareous.		0	0	100	64	42
100		12	40								
100		15	50								
100		18	60				0	0	100	64	42
		21	70								

▲(pcf) 80 90 100 110 120 130 140

●(%) 5 10 15 20 25 30 35

▲ 68.3



100
100
100
100
100
95
100
100
-18
-21
-24
-27
-30
-33
-36
-39
-42
60
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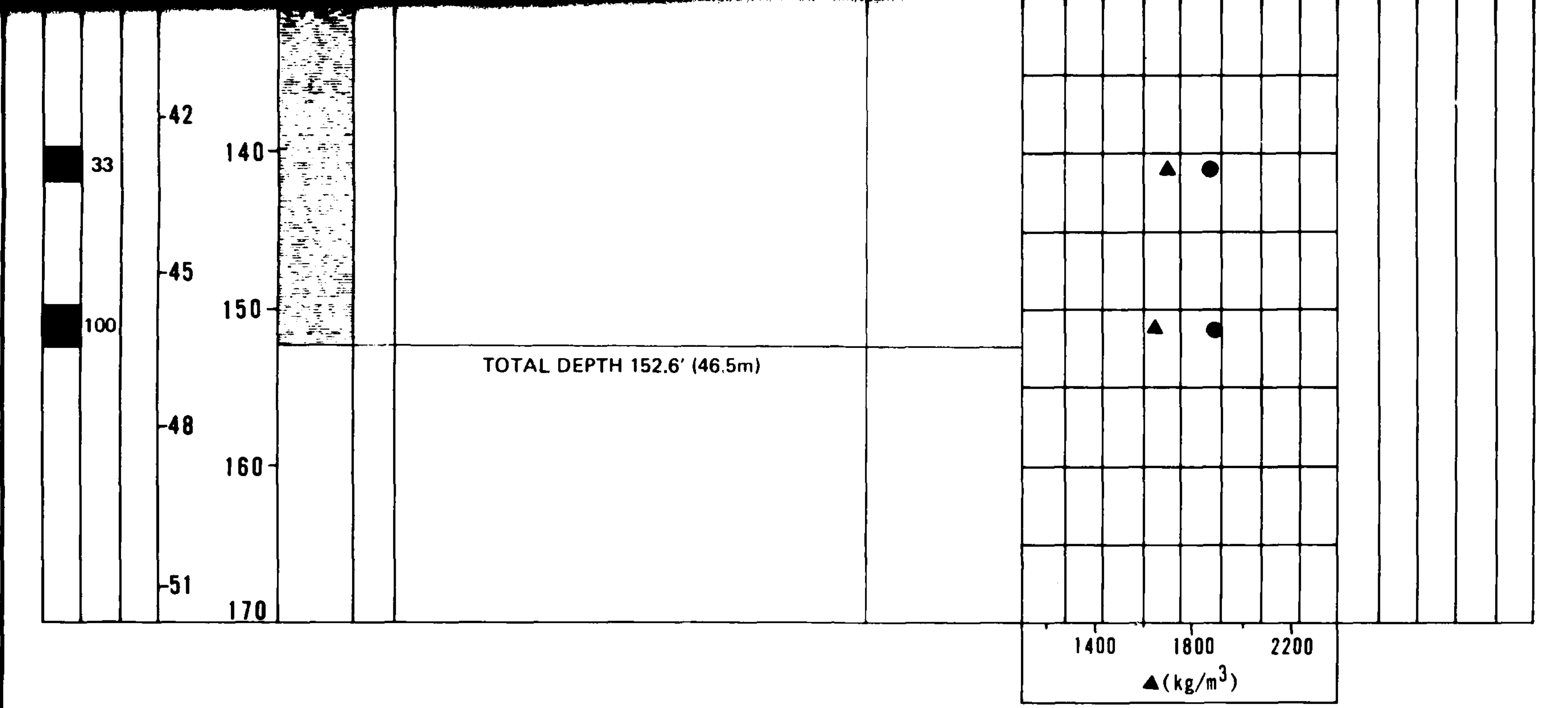
2



1 3

EXPLANATION

- FUGRO DRIVE SAMPLE
- BULK SAMPLE
- PITCHER TUBE SAMPLE
- STANDARD PENETRATION TEST SAMPLE
- CORE SAMPLE

N – STANDARD PENETRATION RESISTANCE

▲ – DRY UNIT WEIGHT (ASTM: D-2937-71)

● – MOISTURE CONTENT (ASTM: D-2216-71)

NR – NO RECOVERY

† – TEST LOCATION APPROXIMATELY 5 FEET FROM BORING

BORING DETAILS

ELEVATION	: 4650' (1417m)
SURFICIAL GEOLOGIC UNIT	: A5y/A4o
DATE DRILLED	: 1 July 1980
DRILLING METHOD	: Rotary Wash
HOLE DIAMETER	: 4 7/8" (124mm)
WATER LEVEL	: Not Encountered

LOG OF BORING WA-B-2
WAH WAH VALLEY, UTAH

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE BMO

FIGURE
II-5-2

FUGRO NATIONAL, INC.

CHECKED BY ______ APPROVED BY ______

SAMPLE TYPE	% RECOVERY	N VALUE †	DEPTH METERS	DEPTH FEET	LITHOLOGY	USCS	REMARKS	▲(pcf) 80 90 100 110 120 130 140 / ●(%) 5 10 15 20 25 30 35	SIEVE ANALYSIS GR	SA	FI	LL	PI
	73	8, 11	0	0		SM	Continuous SPT (0.0' - 6.0') sample intervals not shown		12	62	26		
	80	37, 58							19	53	28		
	4/					SP-SM			42	50	8		
	100		3	10		GP-GM							
	/0					SW-SM	cobbles		34	56	10		
	100		6	20									
	100					SM			12	57	31		
	100		9	30		SW-SM							
	80		12	40		SM			6	69	25		
	80		15	50		GP-GM							
	100		18	60		SW-SM							

SOIL DESCRIPTION

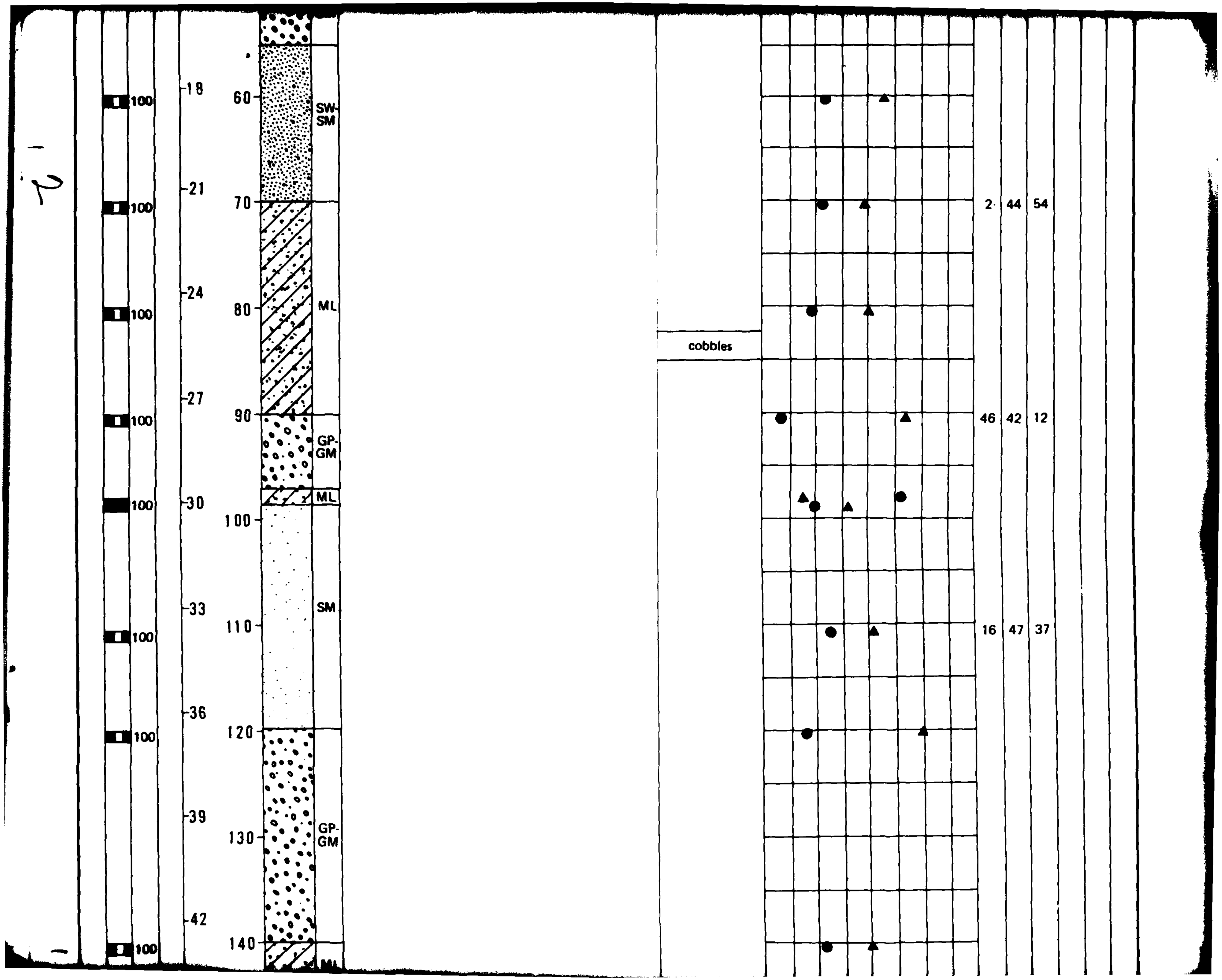
Interbedded layers of GRAVEL, SAND, and FINES:

GRAVEL:
SANDY GRAVEL (GP-GM): light brown to gray, fine to coarse, poorly graded, very dense, subrounded to rounded, calcareous; some fine to coarse sand; trace silt.

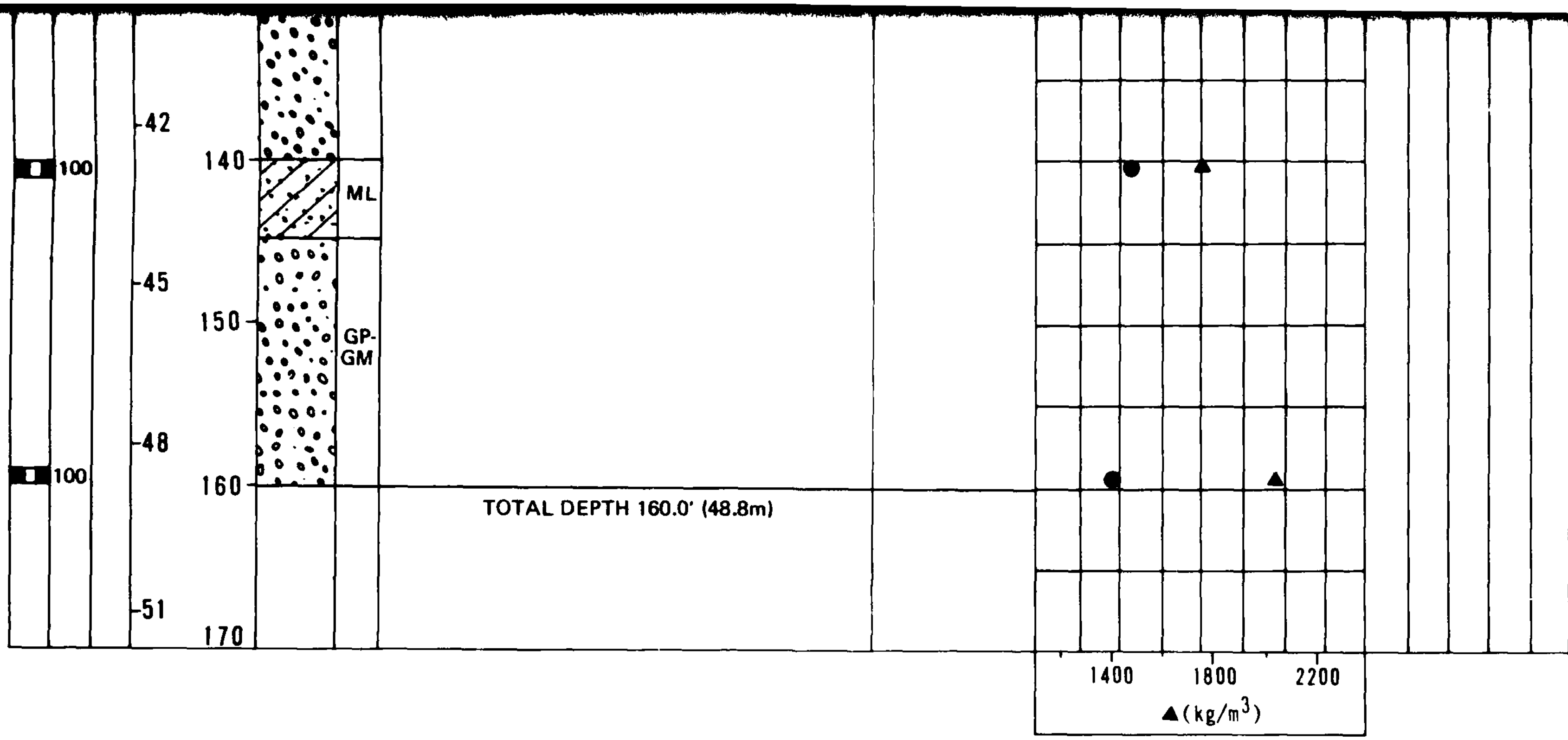
SAND:
GRAVELLY SAND (SW-SM, SP-SM): light brown to light gray, fine to coarse, poorly to well graded, very dense, subrounded to rounded, calcareous; some fine gravel; trace silt.

SILTY SAND (SM): light brown to light gray, fine to coarse, poorly graded, loose to very dense, subrounded to rounded, calcareous; some nonplastic silt; trace to little fine gravel.

FINES:
SANDY SILT (ML): brown, very stiff, nonplastic, calcareous; some fine to medium subrounded to rounded sand.



100
-18
-21
-24
-27
-30
-33
-36
-39
-42
60
70
80
90
100
110
120
130
140
SW-SM
ML
GP-GM
ML
SM
GP-GM
ML
cobbles
2 44 54
46 42 12
16 47 37



EXPLANATION

- FUGRO DRIVE SAMPLE
- BULK SAMPLE
- PITCHER TUBE SAMPLE
- STANDARD PENETRATION TEST SAMPLE
- CORE SAMPLE

N – STANDARD PENETRATION RESISTANCE

▲ – DRY UNIT WEIGHT (ASTM: D-2937-71)

● – MOISTURE CONTENT (ASTM: D-2216-71)

NR – NO RECOVERY

† – TEST LOCATION APPROXIMATELY 5 FEET FROM BORING

BORING DETAILS

ELEVATION	: 4875' (1486m)
SURFICIAL GEOLOGIC UNIT	: A5y
DATE DRILLED	: 15 July 1980
DRILLING METHOD	: Rotary Wash
HOLE DIAMETER	: 4 7/8" (124mm)
WATER LEVEL	: Not Encountered

LOG OF BORING WA-B-3
WAH WAH VALLEY, UTAH

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE BMO

FIGURE II-5-3

FUGRO NATIONAL, INC.

AFV-06

1 - 3

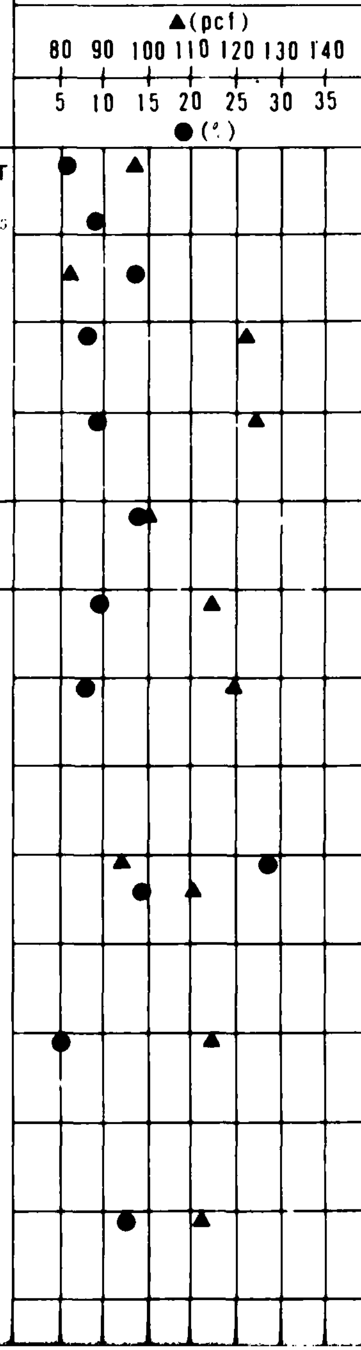
SAMPLE TYPE	% RECOVERY	N VALUE	DEPTH METERS	DEPTH FEET	USCS	SOIL DESCRIPTION	REMARKS	SIEVE ANALYSIS GR	SA	FI	LL	PI
	85	12	0	0	SM	Interbedded layers of GRAVELLY SAND and SILTY SAND:	Continuous SPT (0.0' - 10.5') sample intervals not shown	0	64	36		
		12										
	1.00	11			SM-SC			20	61	19	23	5
		16										
	100	11			SM							
		14										
	90	33	3	10	SP			45	51	4		
	80											
	87		6	20	ML		cementation	0	44	56		
	93				SM			2	74	24		NP
	90		9	30	SW-SM							
	92		12	40	SM							
	100							37	48	15		
	90		15	50								
	100		18	60								

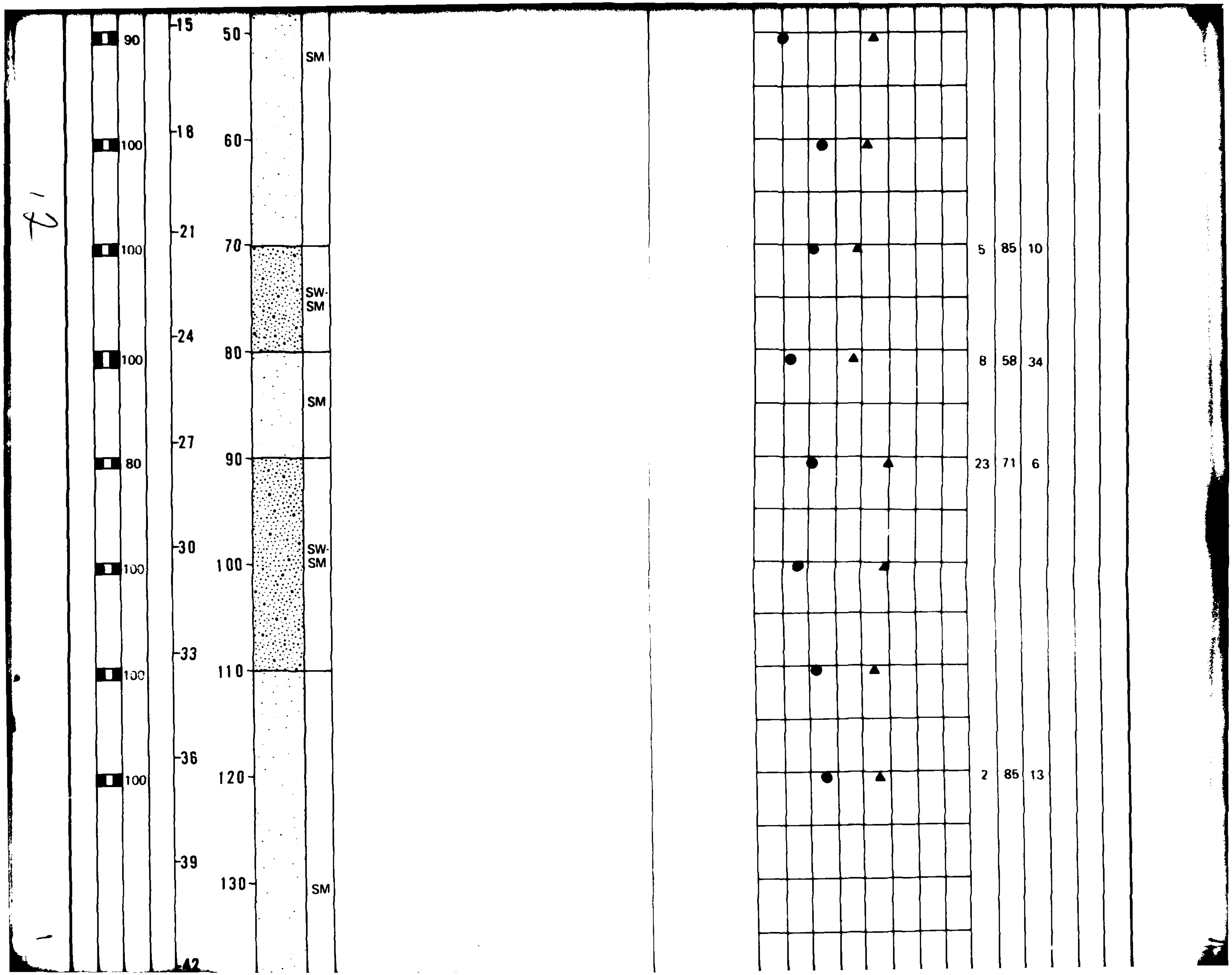
SOIL DESCRIPTION

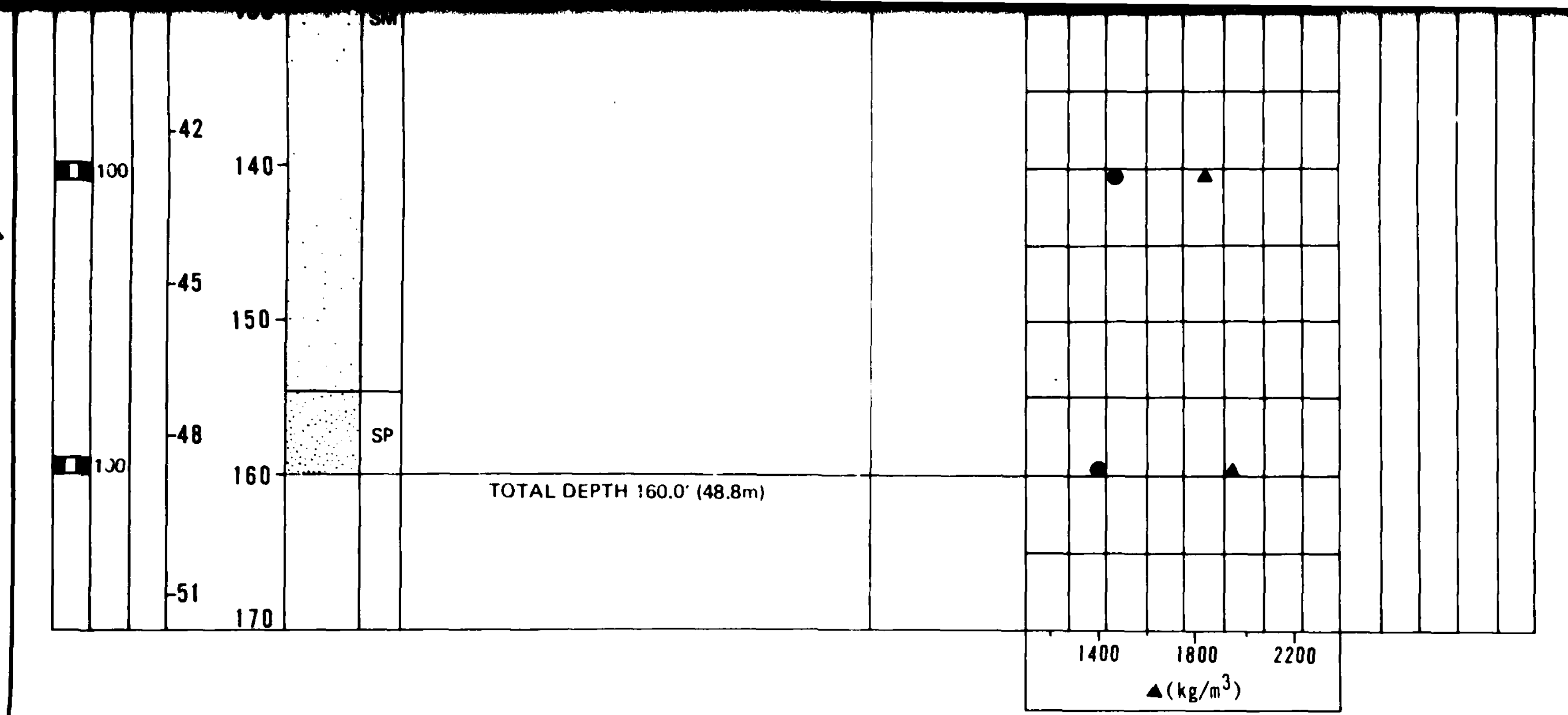
Interbedded layers of GRAVELLY SAND and SILTY SAND:

GRAVELLY SAND (SM-SC, SP, SW-SM, SM): light brown to red, fine to coarse, poorly to well graded, medium dense to very dense, subangular to subrounded, calcareous, little to some fine to coarse gravel; *trace* to little *none* to slightly plastic silt; sand (70.0' - 80.0').

SILTY SANDY (SM): brown, fine to coarse, poorly graded, medium dense to very dense, subangular to subrounded, calcareous, little to some nonplastic silt, *trace* fine gravel; sandy silt (18.0' - 25.0').




90
100
100
100
80
100
100
100
-15
-18
-21
-24
-27
-30
-33
-36
-39
-42
50
60
70
80
90
100
110
120
130
SM
SW-SM
SM
SW-SM
SM
5 85 10
8 58 34
23 71 6
2 85 13



EXPLANATION

- FUGRO DRIVE SAMPLE
- BULK SAMPLE
- PITCHER TUBE SAMPLE
- STANDARD PENETRATION TEST SAMPLE
- CORE SAMPLE

N – STANDARD PENETRATION RESISTANCE

▲ – DRY UNIT WEIGHT (ASTM: D-2937-71)

● – MOISTURE CONTENT (ASTM: D-2216-71)

NR – NO RECOVERY

† – TEST LOCATION APPROXIMATELY 5 FEET FROM BORING

BORING DETAILS

ELEVATION	: 5025' (1532m)
SURFICIAL GEOLOGIC UNIT	: A4o/A5y
DATE DRILLED	: 16 July 1980
DRILLING METHOD	: Rotary Wash
HOLE DIAMETER	: 4 7/8" (124mm)
WATER LEVEL	: Not Encountered

LOG OF BORING WA-B-4
WAH WAH VALLEY, UTAH

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE BMO

FIGURE
II-5-4

FUGRO NATIONAL, INC.

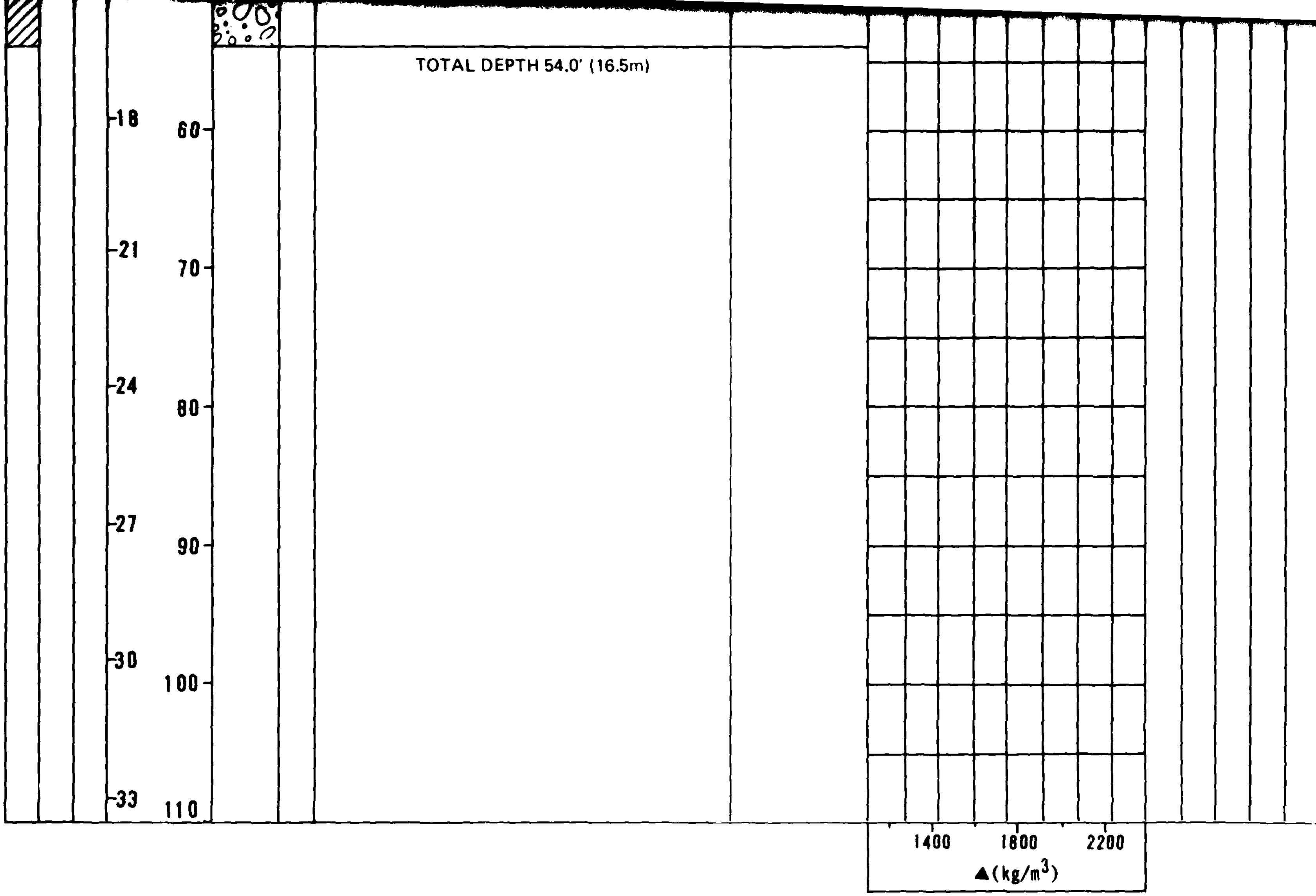
AFV-06

1 3

SAMPLE TYPE	% RECOVERY	N VALUE	DEPTH METERS	DEPTH FEET	USCS	SOIL DESCRIPTION	REMARKS	SIEVE ANALYSIS GR	SA	FI	LL	PI
			0	0	SM	SILTY SAND, brown, fine to coarse, poorly graded, dense, subrounded to rounded, calcareous; some silt; some fine to coarse gravel.		24	50	26		
	80				SM	GRAVELLY SAND, brown, fine to coarse, poorly graded, dense, subangular to rounded, calcareous; little to some fine gravel; *little nonplastic silt.*		20	66	14		
	100		3	10								
	100				GW-GM	SANDY GRAVEL, brown, fine to coarse, poorly to well graded, very dense, subangular to subrounded, calcareous; some fine to coarse sand; *trace silt, stage* IV *caliche* (46.0' - 54.0').		59	34	7		
	100		6	20								
							cobbles and boulders					
	100		9	30	GP-GM							
					GW			64	35	1		
			12	40								
			15	50								
						TOTAL DEPTH 54.0' (16.5m)						
			18	60								

▲(pcf) 80 90 100 110 120 130 140

● (%) 5 10 15 20 25 30 35



EXPLANATION

- FUGRO DRIVE SAMPLE
- BULK SAMPLE
- PITCHER TUBE SAMPLE
- STANDARD PENETRATION TEST SAMPLE
- CORE SAMPLE
- N - STANDARD PENETRATION RESISTANCE

BORING DETAILS

ELEVATION	: 5240' (1597m)
SURFICIAL GEOLOGIC UNIT	: A5i
DATE DRILLED	: 17 July 1980
DRILLING METHOD	: Rotary Wash
HOLE DIAMETER	: 4 7/8" (124mm)
WATER LEVEL	: Not Encountered

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FUGRO NAT

'2

EXPLANATION

- FUGRO DRIVE SAMPLE
- BULK SAMPLE
- PITCHER TUBE SAMPLE
- STANDARD PENETRATION TEST SAMPLE
- CORE SAMPLE

N – STANDARD PENETRATION RESISTANCE

▲ – DRY UNIT WEIGHT (ASTM: D-2937-71)

● – MOISTURE CONTENT (ASTM: D-2216-71)

NR – NO RECOVERY

† – TEST LOCATION APPROXIMATELY 5 FEET FROM BORING

BORING DETAILS

ELEVATION	: 5240' (1597m)
SURFICIAL GEOLOGIC UNIT	: A5i
DATE DRILLED	: 17 July 1980
DRILLING METHOD	: Rotary Wash
HOLE DIAMETER	: 4 7/8" (124mm)
WATER LEVEL	: Not Encountered

LOG OF BORING WA-B-5
WAH WAH VALLEY, UTAH

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE – BMO

FIGURE II-5-5

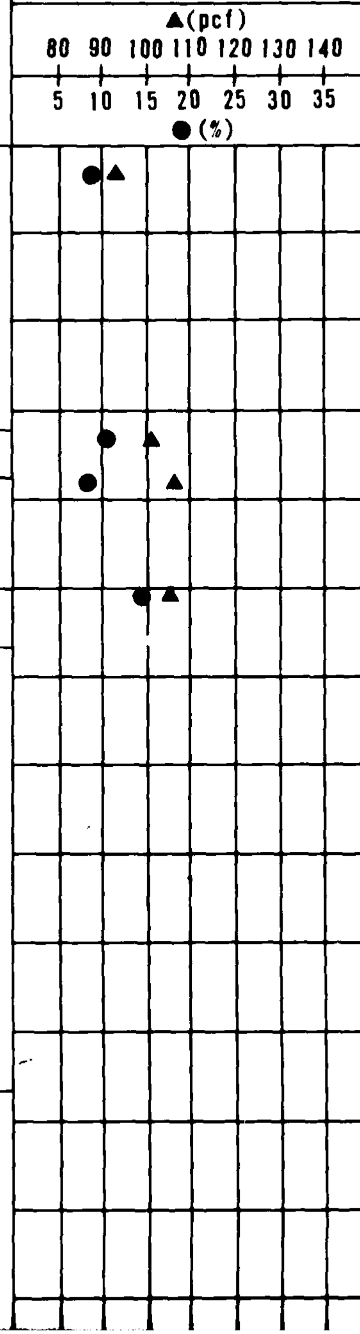
FUGRO NATIONAL, INC.

AFV-06

1 3

CHECKED BY ______ APPROVED BY ______

SAMPLE TYPE	% RECOVERY	N VALUE	DEPTH METERS	DEPTH FEET	LITHOLOGY	USCS	SOIL DESCRIPTION	REMARKS	GR	SA	FI	LL	PI
	50		0	0		SM	SILTY SAND, light brown, fine to coarse, poorly graded, loose, subangular to subrounded, calcareous, little nonplastic silt.		0	81	19		
			3	10		GP-GM	SANDY GRAVEL, brown, fine to coarse, poorly graded, loose, angular to subangular, calcareous; little fine to coarse sand, trace nonplastic silt.						
	47					SM	SILTY SAND, light brown to brown, fine to coarse, poorly graded, dense to very dense, subangular to subrounded, calcareous, little to some nonplastic silt, none to trace fine gravel.	cementation	0	76	24		
	47		6	20					3	77	20		NP
	60							cementation	6	68	26		
			9	30		Rock	DACITE PORPHRY, gray-black, porphyritic.						
			12	40									
			15	50									
							TOTAL DEPTH 53.5' (16.3m)						
			18	60									



24 MAR 81

TOTAL DEPTH 53.5' (16.3m)

m	ft
18	60
21	70
24	80
27	90
30	100
33	110

1400 1800 2200
▲ (kg/m³)

EXPLANATION

- FUGRO DRIVE SAMPLE
- BULK SAMPLE
- PITCHER TUBE SAMPLE
- STANDARD PENETRATION TEST SAMPLE
- CORE SAMPLE

N - STANDARD PENETRATION RESISTANCE

▲ DRY UNIT WEIGHT (ASTM: D-2937-71)

BORING DETAILS

ELEVATION	: 5020' (1530m)
SURFICIAL GEOLOGIC UNIT	: A4o/A5y
DATE DRILLED	: 8 October 1979
DRILLING METHOD	: Rotary Wash
HOLE DIAMETER	: 4 7/8" (124mm)
WATER LEVEL	: Not Encountered

LOG OF BORING W
WAH WAH VALLEY

MX SITING INVESTIGATI
DEPARTMENT OF THE AIR FORCE

FUGRO NATI

, 2

EXPLANATION

- FUGRO DRIVE SAMPLE
- BULK SAMPLE
- PITCHER TUBE SAMPLE
- STANDARD PENETRATION TEST SAMPLE
- CORE SAMPLE

N – STANDARD PENETRATION RESISTANCE

▲ – DRY UNIT WEIGHT (ASTM: D-2937-71)

● – MOISTURE CONTENT (ASTM: D-2216-71)

NR – NO RECOVERY

† – TEST LOCATION APPROXIMATELY 5 FEET FROM BORING

BORING DETAILS

ELEVATION	: 5020' (1530m)
SURFICIAL GEOLOGIC UNIT	: A4o/A5y
DATE DRILLED	: 8 October 1979
DRILLING METHOD	: Rotary Wash
HOLE DIAMETER	: 4 7/8" (124mm)
WATER LEVEL	: Not Encountered

LOG OF BORING WA-B-6
WAH WAH VALLEY, UTAH

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - BMO

FIGURE
II-5-6

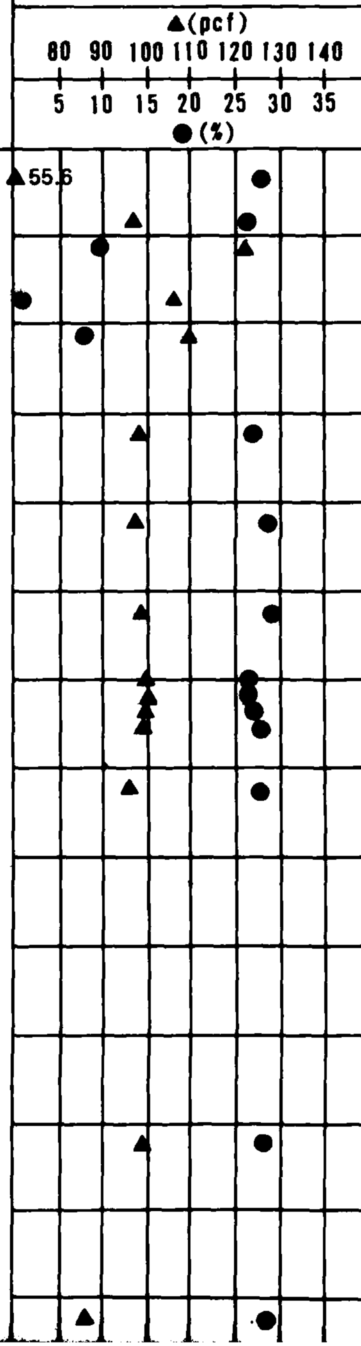
FUGRO NATIONAL, INC.

AFV-06

3

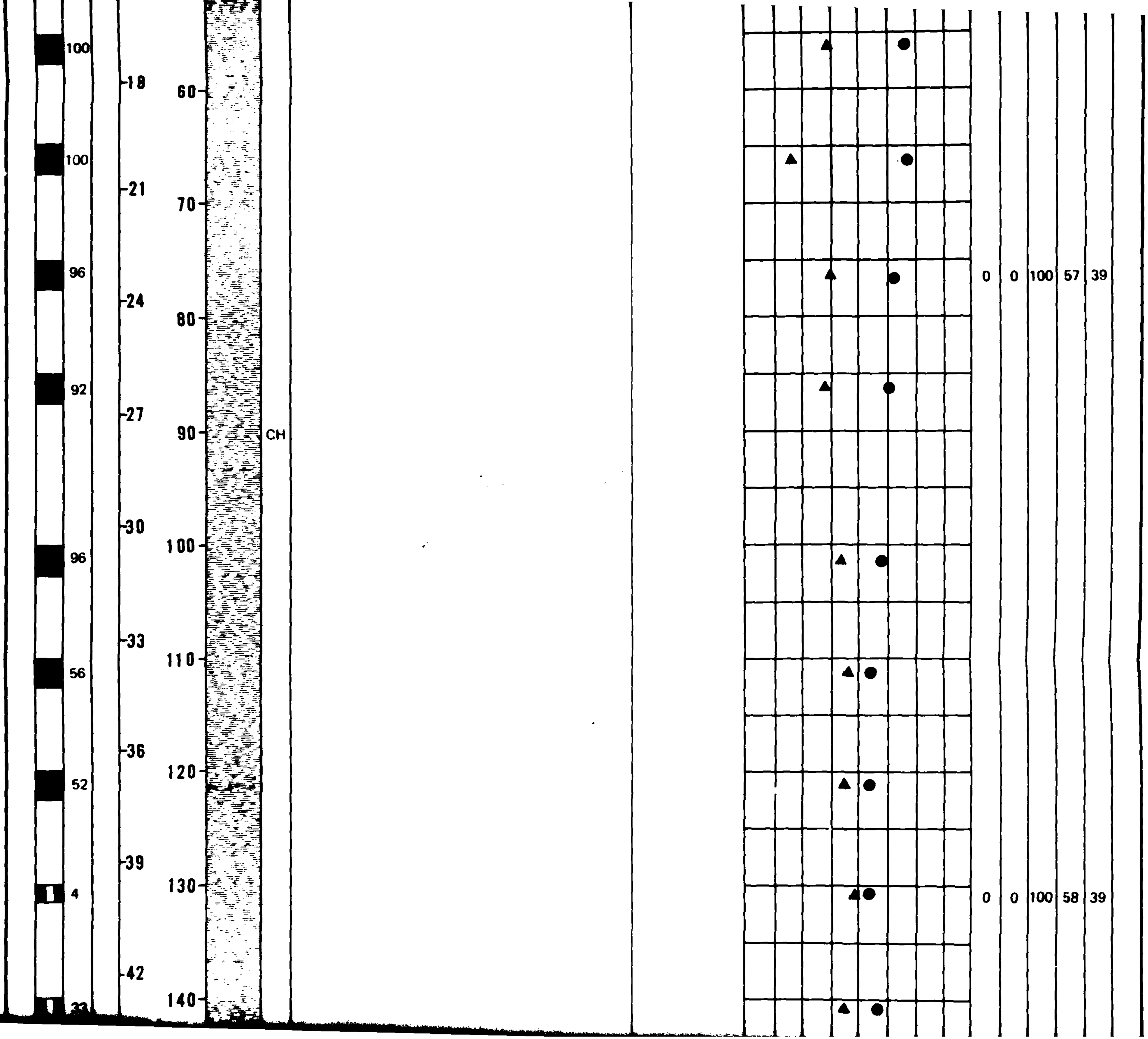
CHECKED BY: ______ / ______ APPROVED BY: ______ / ______

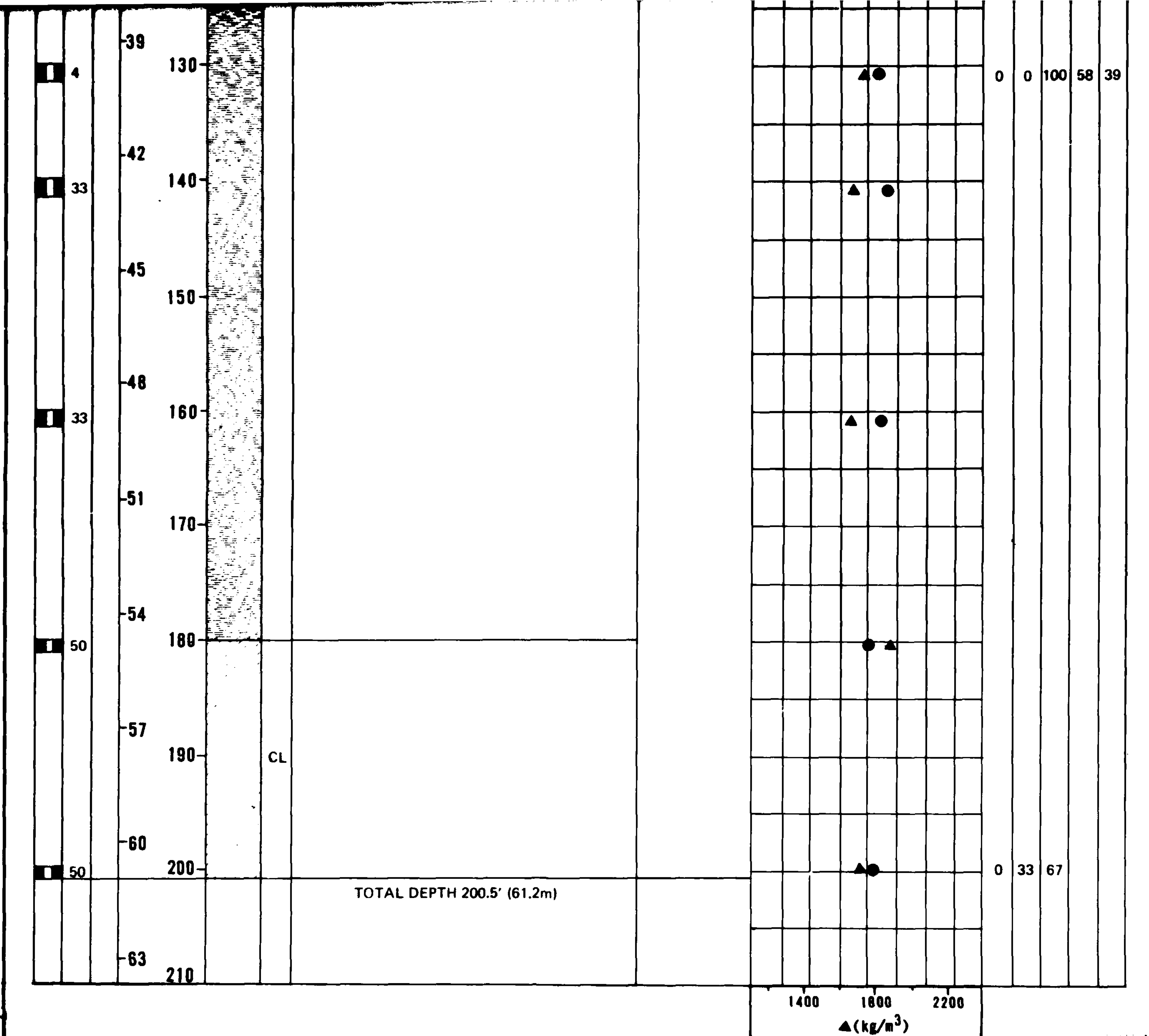
SAMPLE TYPE	% RECOVERY	N VALUE	DEPTH METERS	DEPTH FEET	LITHOLOGY	USCS	SOIL DESCRIPTION	REMARKS	SIEVE ANALYSIS GR	SA	FI	LL	PI
	33		0	0		MH	SILT, white, soft, slightly plastic, calcareous.		0	2	98	57	14
	43					CH	CLAY, gray, soft, medium plastic, calcareous.						
	33												
	33					SP	SAND, brown, fine to medium, poorly graded, medium dense, calcareous.		3	94	3		
	33		3	10									
						CL	SANDY CLAY, brown, stiff, slightly plastic, calcareous; some fine subangular to subrounded sand.						
	48						CLAY, green to gray, stiff to very stiff, *highly plastic, calcareous.*		0	1	99	53	34
	52		6	20									
	72												
	100		9	30					0	1	99	57	39
	96												
			12	40									
			15	50									
	100												
			18	60									
	100												



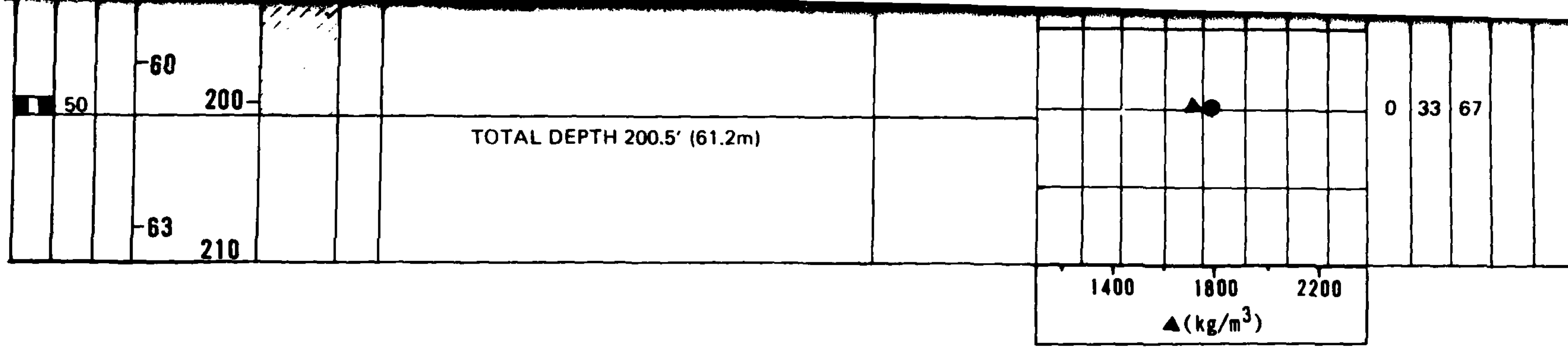
12

1


100
100
96
92
96
56
52
4
33
-18
-21
-24
-27
-30
-33
-36
-39
-42
60
70
80
90
100
110
120
130
140
CH
0 0 100 57 39
0 0 100 58 39


4
33
33
50
50
-39
-42
-45
-48
-51
-54
-57
-60
-63
130
140
150
160
170
180
190
200
210
CL
TOTAL DEPTH 200.5' (61.2m)
0 0 100 58 39
0 33 67
1400
1800
2200
▲(kg/m³)

13



EXPLANATION

- FUGRO DRIVE SAMPLE
- BULK SAMPLE
- PITCHER TUBE SAMPLE
- STANDARD PENETRATION TEST SAMPLE
- CORE SAMPLE

N – STANDARD PENETRATION RESISTANCE

▲ – DRY UNIT WEIGHT (ASTM: D-2937-71)

● – MOISTURE CONTENT (ASTM: D-2216-71)

NR – NO RECOVERY

† – TEST LOCATION APPROXIMATELY 5 FEET FROM BORING

BORING DETAILS

ELEVATION	: 4620' (1408m)
SURFICIAL GEOLOGIC UNIT	: A4o
DATE DRILLED	: 10 October 1979
DRILLING METHOD	: Rotary Wash
HOLE DIAMETER	: 4 7/8" (124mm)
WATER LEVEL	: 178' (54.3m)

LOG OF BORING WA-B-7
WAH WAH VALLEY, UTAH

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE BMO

FIGURE
II-5-7

FUGRO NATIONAL, INC.

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6.0 TRENCH AND TEST PIT LOGS

See Section 5.0, "Boring Logs," for explanation.

BULK SAMPLE	DEPTH METERS	DEPTH FEET	LITHOLOGY	USCS	CONSISTENCY	SOIL DESCRIPTION	REMARKS	SIEVE ANALYSIS GR	SIEVE ANALYSIS SA	SIEVE ANALYSIS FI	LL	PI
	0	0–2		SM	loose	SILTY SAND, light brown, fine to coarse, poorly graded, dry, subangular to subrounded, calcareous; little nonplastic silt; little fine to coarse gravel.	vertical walls stable	15	68	17		
	1	2–6		GP-GC	medium dense	SANDY GRAVEL, white, fine to coarse, poorly graded, dry, angular to subrounded, calcareous; some fine to coarse sand; little slightly plastic clay; stage II caliche (2.0' - 8.5').						
	2	6–8.5		SM	dense / very dense	SILTY SAND, brown, fine to coarse, poorly graded, dry, angular to subrounded, calcareous; little nonplastic silt; little fine to coarse gravel.						
	3	10				TOTAL DEPTH 8.5' (2.6m)	excavation capacity of Case 580C backhoe exceeded at 8.5'					
	4	12, 14										
	5	16, 18										
	6	20										

TRENCH DETAILS

SURFACE ELEVATION : 4955' (1510m)
DATE EXCAVATED : 21 September 1979
SURFICIAL GEOLOGIC UNIT : A5y/A40
TRENCH LENGTH : 12.0' (3.7m)
TRENCH ORIENTATION : N-S

LOG OF TRENCH WA-T-1
WAH WAH VALLEY, UTAH

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - BMO

FIGURE II-6-1

FUGRO NATIONAL, INC.

CHECKED BY ____ APPROVED BY ____

BULK SAMPLE	DEPTH (FEET)	USCS	CONSISTENCY	SOIL DESCRIPTION	REMARKS	SIEVE ANALYSIS GR	SA	FI	LL	PI
sampled	0–3	GM	medium dense	SANDY GRAVEL, light brown, fine to coarse, poorly graded, dry, subangular to subrounded, calcareous; some fine to coarse sand; trace to little nonplastic silt; little cobbles to 10" size; stage I caliche (0.5' - 8.0').	vertical walls stable	56	24	20		
sampled	3–8	GP-GM	dense			64	29	7		
	8			TOTAL DEPTH 8.0' (2.4m)	excavation capacity of Case 580C backhoe exceeded at 8.0'					

Depth scale: METERS 0, 1, 2, 3, 4, 5, 6; FEET 0, 2, 4, 6, 8, 10, 12, 14, 16, 18, 20.

TRENCH DETAILS

SURFACE ELEVATION : 5240' (1597m)
DATE EXCAVATED : 14 June 1980
SURFICIAL GEOLOGIC UNIT : A5i
TRENCH LENGTH : 14.0' (4.3m)
TRENCH ORIENTATION : N-S

LOG OF TRENCH WA-T-2
WAH WAH VALLEY, UTAH

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - BMO

FIGURE II-6-2

FUGRO NATIONAL, INC.

CHECKED BY ______ / ______ APPROVED BY ______ / ______

FN-TR-27-WA-II

Depth (feet)	USCS	Consistency	Soil Description	Remarks	GR	SA	FI	LL	PI
0 – 3.5	CL-ML	firm	SANDY SILT, light brown, slightly moist, slightly plastic, calcareous; some fine to medium subrounded sand.	vertical walls stable (0 – 14.0)	0	48	52	25	4
3.5 – 8.0	ML	firm	SILT, light gray to white, dry, slightly plastic, calcareous; trace subrounded sand; stage *III* caliche (3.5' - 8.0').		0	5	95	44	7
8.0 – 14.0	SM	medium dense	SILTY SAND, grey-brown, fine to coarse, poorly graded, dry, subrounded, calcareous; little nonplastic silt; interbedded lenses of sandy silt throughout.		3	83	14		
14.0			TOTAL DEPTH 14.0' (4.3m)						

Column headings: BULK SAMPLE; DEPTH (METERS, FEET); LITHOLOGY; USCS; CONSISTENCY; SOIL DESCRIPTION; REMARKS; SIEVE ANALYSIS (GR, SA, FI); LL; PI.

Depth scale: meters 0–6; feet 0–20.

TRENCH DETAILS

SURFACE ELEVATION	: 4915' (1498m)
DATE EXCAVATED	: 14 June 1980
SURFICIAL GEOLOGIC UNIT	: A5y/A40
TRENCH LENGTH	: 14.0' (4.3m)
TRENCH ORIENTATION	: N-S

LOG OF TRENCH WA-T-3
WAH WAH VALLEY, UTAH

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - BMO

FIGURE II-6-3

FUGRO NATIONAL, INC.

CHECKED BY ____ APPROVED BY ____

Depth (feet)	USCS	Consistency	Soil Description	Remarks	GR	SA	FI	LL	PI
0 – 5	CL	stiff	SANDY CLAY, brown, dry, slightly plastic, calcareous; some fine to medium subrounded sand.	vertical walls stable (0 – 14)	0	41	59	33	15
5 – 7	SM	medium dense	SILTY SAND, brown, fine to coarse, poorly graded, dry, subrounded, calcareous; little nonplastic silt.		1	82	17		
7 – 10	CL	stiff	SILTY CLAY, gray, dry, slightly plastic, calcareous; stage II caliche (7.0' - 10.0').						
10 – 14	SP	dense	GRAVELLY SAND, brown, fine to coarse, poorly graded, dry, subangular to subrounded, calcareous; some fine to coarse gravel; trace cobbles to 10" size.						
14			TOTAL DEPTH 14.0' (4.3m)						

Column headings: BULK SAMPLE; DEPTH (METERS, FEET); LITHOLOGY; USCS; CONSISTENCY; SOIL DESCRIPTION; REMARKS; SIEVE ANALYSIS (GR, SA, FI); LL; PI

TRENCH DETAILS

SURFACE ELEVATION	: 5025' (1532m)
DATE EXCAVATED	: 14 June 1980
SURFICIAL GEOLOGIC UNIT	: A40/A5y
TRENCH LENGTH	: 14.0' (4.3m)
TRENCH ORIENTATION	: E-W

LOG OF TRENCH WA-T-4
WAH WAH VALLEY, UTAH

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - BMO

FIGURE II-6-4

FUGRO NATIONAL, INC.

CHECKED BY ______ APPROVED BY ______

FN-TR-27-WA-II

BULK SAMPLE	DEPTH METERS	DEPTH FEET	LITHOLOGY	USCS	CONSISTENCY	SOIL DESCRIPTION	REMARKS	SIEVE ANALYSIS GR	SA	FI	LL	PI
	0	0		SM	dense; very dense	SILTY SAND, light brown, fine to coarse, poorly graded, dry, subangular to subrounded, calcareous; some nonplastic silt; some fine to coarse gravel; occasional cobbles and boulders to 18'' size; stage II caliche (1.0' - 4.5'); stage IV caliche (4.5' - 5.0').	vertical walls stable	27	45	28		
						TOTAL DEPTH 5.0' (1.5m)	cementation at 5.0' exceeded capacity of Case 580C backhoe					

TRENCH DETAILS

- **SURFACE ELEVATION** : 5470' (1667m)
- **DATE EXCAVATED** : 15 June 1980
- **SURFICIAL GEOLOGIC UNIT** : A5y
- **TRENCH LENGTH** : 14.0' (4.3m)
- **TRENCH ORIENTATION** : N-S

LOG OF TRENCH WA-T-5
WAH WAH VALLEY, UTAH

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - BMO

FIGURE II-6-5

FUGRO NATIONAL, INC.

CHECKED BY ______ APPROVED BY ______

BULK SAMPLE	DEPTH METERS	DEPTH FEET	LITHOLOGY	USCS	CONSISTENCY	SOIL DESCRIPTION	REMARKS	SIEVE ANALYSIS GR	SA	FI	LL	PI
	0–1.5	0–5		SM	medium dense	SILTY SAND, light brown, fine to coarse, poorly graded, dry, subangular to subrounded, calcareous; some slightly plastic silt; trace gravel; occasional cobbles to 6" size.	vertical walls stable (0–14 ft)					
	1.5–4.3	5–14		SP-SM	medium dense	GRAVELLY SAND, brown, fine to coarse, poorly graded, slightly moist, subangular to subrounded, calcareous; little gravel; trace nonplastic silt; occasional cobbles and boulders to 18" size.						
		14				TOTAL DEPTH 14.0' (4.3m)						

TRENCH DETAILS

SURFACE ELEVATION : 5300' (1615m)
DATE EXCAVATED : 15 June 1980
SURFICIAL GEOLOGIC UNIT : A5i
TRENCH LENGTH : 14.0' (4.3m)
TRENCH ORIENTATION : N-S

LOG OF TRENCH WA-T-6
WAH WAH VALLEY, UTAH

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - BMO

FIGURE II-6-6

FUGRO NATIONAL, INC.

CHECKED BY ____ / ____ APPROVED BY ____ / ____

BULK SAMPLE	DEPTH (FEET)	LITHOLOGY	USCS	CONSISTENCY	SOIL DESCRIPTION	REMARKS	SIEVE ANALYSIS GR	SA	FI	LL	PI
	0–4.5		SM	medium dense	SILTY SAND, light brown, fine to coarse, poorly graded, dry, subangular to subrounded, calcareous; some slightly plastic silt; trace gravel.	vertical walls stable	6	61	33	35	10
	4.5–14		SW	medium dense	GRAVELLY SAND, brown, fine to coarse, well graded, slightly moist, subangular to subrounded, calcareous; some fine to coarse gravel; occasional cobbles to 6" size.		39	57	4		
	14				TOTAL DEPTH 14.0' (4.3m)						

TRENCH DETAILS

SURFACE ELEVATION : 5510' (1679m)
DATE EXCAVATED : 15 June 1980
SURFICIAL GEOLOGIC UNIT : A5i
TRENCH LENGTH : 14.0' (4.3m)
TRENCH ORIENTATION : N-S

LOG OF TRENCH WA-T-7
WAH WAH VALLEY, UTAH

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - BMO

FIGURE II-6-7

FUGRO NATIONAL, INC.

CHECKED BY ________ APPROVED BY ________

BULK SAMPLE	DEPTH METERS	DEPTH FEET	LITHOLOGY	USCS	CONSISTENCY	SOIL DESCRIPTION	REMARKS	SIEVE ANALYSIS GR	SA	FI	LL	PI
	0	0		ML	firm	SANDY SILT, light brown, dry, nonplastic, calcareous; some fine to coarse subrounded sand; trace gravel.	vertical walls stable	6	43	51	23	3
	2	6		SP-SM	dense / very dense	GRAVELLY SAND, brown, fine to coarse, poorly graded, slightly moist, subangular to subrounded, calcareous; some fine gravel; trace nonplastic silt; occasional cobbles and boulders to 20" size (5.0' - 7.5').		22	66	12		
						TOTAL DEPTH 11.0' (3.4m)	excavation capacity of Case 580C backhoe exceeded at 11.0'					

TRENCH DETAILS

SURFACE ELEVATION : 5180' (1579m)
DATE EXCAVATED : 15 June 1980
SURFICIAL GEOLOGIC UNIT : A5i
TRENCH LENGTH : 14.0' (4.3m)
TRENCH ORIENTATION : E-W

LOG OF TRENCH WA-T-8
WAH WAH VALLEY, UTAH

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - BMO

FIGURE II-6-8

FUGRO NATIONAL, INC.

CHECKED BY ____ / ____ APPROVED BY ____ / ____

Depth (feet)	Lithology	USCS	Consistency	Soil Description	Remarks	GR	SA	FI	LL	PI
0–4.5		SM	medium dense	SILTY SAND, light brown, fine to coarse, poorly graded, dry, subangular to subrounded, calcareous; little nonplastic silt; trace gravel; stage III caliche (1.0' - 2.0').	vertical walls stable (0–14')					
4.5–14		SW-SM	dense	GRAVELLY SAND, light brown, fine to coarse, poorly graded, dry, subangular to subrounded, calcareous; some fine gravel; trace nonplastic silt.		40	55	5		
14				TOTAL DEPTH 14.0' (4.3m)						

Column headings: BULK SAMPLE; DEPTH (METERS, FEET); LITHOLOGY; USCS; CONSISTENCY; SOIL DESCRIPTION; REMARKS; SIEVE ANALYSIS (GR, SA, FI); LL; PI

Depth scale: METERS 0, 1, 2, 3, 4, 5, 6; FEET 0, 2, 4, 6, 8, 10, 12, 14, 16, 18, 20

TRENCH DETAILS

SURFACE ELEVATION : 5630' (1[illegible]m)
DATE EXCAVATED : 16 June 1980
SURFICIAL GEOLOGIC UNIT : A5i
TRENCH LENGTH : 14.0' (4.3m)
TRENCH ORIENTATION : N-S

LOG OF TRENCH WA-T-9
WAH WAH VALLEY, UTAH

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - BMO

FIGURE II-6-9

FUGRO NATIONAL, INC.

CHECKED BY ______ APPROVED BY ______

BULK SAMPLE	DEPTH METERS	DEPTH FEET	LITHOLOGY	USCS	CONSISTENCY	SOIL DESCRIPTION	REMARKS	SIEVE ANALYSIS GR	SA	FI	LL	PI
	0	0		SW-SM	dense	GRAVELLY SAND, light brown, fine to coarse, poorly to well graded, dry, subangular to subrounded, calcareous; some fine to coarse gravel; trace nonplastic silt; occasional cobbles to 6" size; stage II caliche (0.5' - 5.5'); stage IV caliche (5.5' - 6.0').	vertical walls stable	39	53	8		
	1	2, 4		SP-SM	dense / very dense							
	2	6				TOTAL DEPTH 6.0' (1.8m)	cementation at 6.0' exceeded capacity of Case 580C backhoe					
	3, 4, 5, 6	8, 10, 12, 14, 16, 18, 20										

TRENCH DETAILS

- **SURFACE ELEVATION** : 5720' (1743m)
- **DATE EXCAVATED** : 16 June 1980
- **SURFICIAL GEOLOGIC UNIT** : A5i
- **TRENCH LENGTH** : 13.0' (4.0m)
- **TRENCH ORIENTATION** : N-S

LOG OF TRENCH WA-T-10
WAH WAH VALLEY, UTAH

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - BMO

FIGURE II-6-10

FUGRO NATIONAL, INC.

CHECKED BY ____ APPROVED BY ____

BULK SAMPLE	DEPTH (FEET)	USCS	CONSISTENCY	SOIL DESCRIPTION	REMARKS	GR	SA	FI	LL	PI
	0	SC	loose	CLAYEY SAND, brown, fine to medium, poorly graded, moist, subrounded, calcareous; some slightly plastic clay; some fine gravel.	caving	22	38	40	29	11
	2	SP-SM	medium dense	GRAVELLY SAND, brown, fine to coarse, poorly graded, moist, subrounded, calcareous; some fir_ gravel; trace nonplastic silt.		44	45	11		
	4 – 10	SP	medium dense	GRAVELLY SAND, gray, fine to coarse, poorly graded, dry, subrounded, calcareous; some gravel.						
	10			TOTAL DEPTH 10.0' (3.0m)	excavation terminated due to excessive caving					

TRENCH DETAILS

SURFACE ELEVATION : 4760' (1451m)
DATE EXCAVATED : 17 June 1980
SURFICIAL GEOLOGIC UNIT : A40
TRENCH LENGTH : 14.0' (4.3m)
TRENCH ORIENTATION : E-W

LOG OF TRENCH WA-T-11
WAH WAH VALLEY, UTAH

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - BMO

FIGURE II-6-11

FUGRO NATIONAL, INC.

CHECKED BY ______ APPROVED BY ______

BULK SAMPLE	DEPTH METERS	DEPTH FEET	LITHOLOGY	USCS	CONSISTENCY	SOIL DESCRIPTION	REMARKS	SIEVE ANALYSIS GR	SA	FI	LL	PI
	0	0		GM	dense; very dense	SANDY GRAVEL, light brown, fine to coarse, poorly graded, dry, subangular, calcareous; some fine to coarse subangular to subrounded sand; little nonplastic silt; little cobbles.	vertical walls stable	55	28	17		
		11.0				TOTAL DEPTH 11.0' (3.4m)	excavation capacity of Case 580C backhoe exceeded at 11.0'					

TRENCH DETAILS

SURFACE ELEVATION : 5275' (1608m)
DATE EXCAVATED : 17 June 1980
SURFICIAL GEOLOGIC UNIT : A5i
TRENCH LENGTH : 14.0' (4.3m)
TRENCH ORIENTATION : N-S

CHECKED BY ______ APPROVED BY ______

LOG OF TRENCH WA-T-12
WAH WAH VALLEY, UTAH

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - BMO

FIGURE II-6-12

FUGRO NATIONAL, INC.

FN-TR-27-WA-II

BULK SAMPLE	DEPTH METERS	DEPTH FEET	LITHOLOGY	USCS	CONSISTENCY	SOIL DESCRIPTION	REMARKS	SIEVE ANALYSIS GR	SA	FI	LL	PI
	0	0		SP	medium dense	GRAVELLY SAND, gray-brown, medium to coarse, poorly graded, dry, subrounded, calcareous; some fine subangular to subrounded gravel; trase cobbles to 6" size.	caving	36	61	3		
	3	10				TOTAL DEPTH 9.0' (2.7m)	excavation terminated due to excessive caving					

Depth scale: meters 0, 1, 2, 3, 4, 5, 6; feet 0, 2, 4, 6, 8, 10, 12, 14, 16, 18, 20.

TRENCH DETAILS

SURFACE ELEVATION : 5046' (1538m)
DATE EXCAVATED : 17 June 1980
SURFICIAL GEOLOGIC UNIT : A5y
TRENCH LENGTH : 14.0' (4.3m)
TRENCH ORIENTATION : N-S

LOG OF TRENCH WA-T-13
WAH WAH VALLEY, UTAH

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - BMO

FIGURE II-6-13

FUGRO NATIONAL, INC.

CHECKED BY ______ / APPROVED BY ______

BULK SAMPLE	DEPTH METERS	DEPTH FEET	LITHOLOGY	USCS	CONSISTENCY	SOIL DESCRIPTION	REMARKS	SIEVE ANALYSIS GR	SA	FI	LL	PI
	0	0–3.5		GM	dense	SILTY GRAVEL, light brown, coarse, poorly graded, slightly moist, subangular, calcareous; little nonplastic silt; trace fine sand; some cobbles; occasional boulders to 24" size (0.5' - 8.0').	vertical walls stable	77	8	15		
		3.5–5.5		GP	dense	SANDY GRAVEL, gray-brown, fine to coarse, poorly graded, dry, subangular, calcareous; some fine to coarse subangular to subrounded sand; little cobbles (3.5' - 8.0').						
		5.5–8		GW-GM	very dense	SANDY GRAVEL, light brown, fine to coarse, well graded, dry, subangular, calcareous; some fine to coarse subangular to subrounded sand; trace nonplastic silt.		58	36	6		
		8				TOTAL DEPTH 8.0' (2.4m)	excavation capacity of Case 580C backhoe exceeded at 8.0'					

TRENCH DETAILS

SURFACE ELEVATION : 5420' (1652m)
DATE EXCAVATED : 17 June 1980
SURFICIAL GEOLOGIC UNIT : A5i
TRENCH LENGTH : 14.0' (4.3m)
TRENCH ORIENTATION : N-S

LOG OF TRENCH WA-T-14
WAH WAH VALLEY, UTAH

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - BMO

FIGURE II-6-14

FUGRO NATIONAL, INC.

CHECKED BY ____ / ____ APPROVED BY ____ / ____

BULK SAMPLE	DEPTH METERS	DEPTH FEET	LITHOLOGY	USCS	CONSISTENCY	SOIL DESCRIPTION	REMARKS	SIEVE ANALYSIS GR	SIEVE ANALYSIS SA	SIEVE ANALYSIS FI	LL	PI
	0	0		ML	firm	SANDY SILT, light brown to brown, slightly moist, nonplastic, calcareous; little fine subrounded sand; stage II caliche (3.0' - 9.0' and 11.0' - 14.0'); stage III caliche (9.0' - 11.0').	vertical walls stable	0	14	86		NP
	1	4			stiff							
	2	6										
		8										
	3	10			very stiff							
	4	12			stiff			0	47	53		
		14				TOTAL DEPTH 14.0' (4.3m)						
	5	16										
		18										
	6	20										

TRENCH DETAILS

SURFACE ELEVATION : 4650' (1417m)
DATE EXCAVATED : 24 June 1980
SURFICIAL GEOLOGIC UNIT : A5y/A40
TRENCH LENGTH : 14.0' (4.3m)
TRENCH ORIENTATION : E-W

LOG OF TRENCH WA-T-15
WAH WAH VALLEY, UTAH

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - BMO

FIGURE II-6-15

FUGRO NATIONAL, INC.

CHECKED BY ___ / ___ APPROVED BY ___ / ___

BULK SAMPLE	DEPTH METERS	DEPTH FEET	LITHOLOGY	USCS	CONSISTENCY	SOIL DESCRIPTION	REMARKS	SIEVE ANALYSIS GR	SIEVE ANALYSIS SA	SIEVE ANALYSIS FI	LL	PI
	0 – 1	0 – 4.5		SM	medium dense	SILTY SAND, light gray, fine to coarse, poorly graded, dry, subrounded, calcareous; some non-plastic silt; little fine gravel.	vertical walls stable	15	58	27		
	1 – 3.4	4.5 – 11.0		CH	stiff; very stiff	CLAY, light gray, slightly moist, highly plastic, calcareous.	vertical walls stable	0	0	100	67	43
		11.0				TOTAL DEPTH 11.0' (3.4m)	excavation capacity of Case 580C backhoe exceeded at 11.0'					

TRENCH DETAILS

SURFACE ELEVATION : 4670' (1423m)
DATE EXCAVATED : 24 June 1980
SURFICIAL GEOLOGIC UNIT : A40/A5y
TRENCH LENGTH : 14.0' (4.3m)
TRENCH ORIENTATION : E-W

LOG OF TRENCH WA-T-16
WAH WAH VALLEY, UTAH

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - BMO

FIGURE II-6-16

FUGRO NATIONAL, INC.

FN-TR-27-WA-II

BULK SAMPLE	DEPTH METERS	DEPTH FEET	LITHOLOGY	USCS	CONSISTENCY	SOIL DESCRIPTION	REMARKS	SIEVE ANALYSIS GR	SIEVE ANALYSIS SA	SIEVE ANALYSIS FI	LL	PI
	0	0		GM	dense; very dense	SANDY GRAVEL, light brown, fine to coarse, poorly graded, dry, subangular to subrounded, calcareous; some fine to coarse sand; some non-plastic silt; stage I caliche (0.5' - 3.0'); stage IV caliche (3.0' - 3.5').	vertical walls stable	45	30	25		
	1	2										
		4				TOTAL DEPTH 3.5' (1.1m)	cementation at 3.5' exceeded capacity of Case 580C backhoe					
	2	6										
		8										
	3	10										
		12										
	4	14										
	5	16										
		18										
	6	20										

TRENCH DETAILS

- **SURFACE ELEVATION** : 5290' (1612m)
- **DATE EXCAVATED** : 25 June 1980
- **SURFICIAL GEOLOGIC UNIT** : A5i/A5y
- **TRENCH LENGTH** : 13.0' (4.0m)
- **TRENCH ORIENTATION** : N-S

LOG OF TRENCH WA-T-17
WAH WAH VALLEY, UTAH

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - BMO

FIGURE II-6-17

FUGRO NATIONAL, INC.

CHECKED BY ___ APPROVED BY ___

BULK SAMPLE	DEPTH METERS	DEPTH FEET	LITHOLOGY	USCS	CONSISTENCY	SOIL DESCRIPTION	REMARKS	SIEVE ANALYSIS GR	SA	FI	LL	PI
	0	0		GM	dense	SANDY GRAVEL, gray, fine to coarse, poorly graded, dry, subangular to subrounded, calcareous; some fine to coarse sand; little nonplastic silt; stage II caliche (0.5' - 2.0'); stage III caliche (2.0' - 3.0').	vertical walls stable	46	37	17		
				ML	firm	SANDY SILT, gray, dry, nonplastic, calcareous; some fine to coarse subrounded sand; trace fine gravel.		9	36	55	21	3
				CL	very stiff	CLAY, gray, dry, medium plastic, calcareous; trace gravel.						
						TOTAL DEPTH 11.0' (3.4m)	excavation capacity of Case 580C backhoe exceeded at 11.0'					

TRENCH DETAILS

SURFACE ELEVATION : 4810' (1466m)
DATE EXCAVATED : 25 June 1980
SURFICIAL GEOLOGIC UNIT : A5i/A40
TRENCH LENGTH : 14.0' (4.3m)
TRENCH ORIENTATION : N-S

LOG OF TRENCH WA-T-18
WAH WAH VALLEY, UTAH

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - BMO

FIGURE II-6-18

FUGRO NATIONAL, INC.

BULK SAMPLE	DEPTH METERS	DEPTH FEET	LITHOLOGY	USCS	CONSISTENCY	SOIL DESCRIPTION	REMARKS	SIEVE ANALYSIS GR	SA	FI	LL	PI
	0	0		ML	soft	SILT, white, dry, slightly plastic, calcareous; trace fine subangular to subrounded sand.	sloughing	0	11	89	46	12
	1	2, 4		CL	stiff	CLAY, olive, slightly moist, medium plastic, calcareous.		0	1	99		
	2	6, 8		SP	medium dense	SAND, black, medium to coarse, poorly graded, slightly moist, subangular to rounded, calcareous.						
	3	10		CL	very stiff	CLAY, olive, slightly moist, medium plastic, calcareous.	vertical walls stable					
	4, 5, 6	12, 14, 16, 18, 20				TOTAL DEPTH 11.0' (3.4m)	excavation capacity of Case 580C backhoe exceeded at 11.0'					

TRENCH DETAILS

SURFACE ELEVATION : 4620' (1408m)
DATE EXCAVATED : 20 September 1979
SURFICIAL GEOLOGIC UNIT : A40
TRENCH LENGTH : 14.0' (4.3m)
TRENCH ORIENTATION : N-S

LOG OF TRENCH WA-T-19
WAH WAH VALLEY, UTAH

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - BMO

FIGURE II-6-19

FUGRO NATIONAL, INC.

CHECKED BY ____ APPROVED BY ____

BULK SAMPLE	DEPTH METERS	DEPTH FEET	LITHOLOGY	USCS	CONSISTENCY	SOIL DESCRIPTION	REMARKS	SIEVE ANALYSIS GR	SA	FI	LL	PI
	0	0		SM	medium dense	SILTY SAND, light brown, fine to coarse, poorly graded, moist, subangular to subrounded, calcareous; some slightly plastic silt; trace gravel.	vertical walls stable					
	1	2		SP	medium dense	GRAVELLY SAND, light brown, fine to coarse, poorly graded, moist, subangular to subrounded, calcareous; some fine to coarse gravel; cobbles and boulders to 14" size.		30	66	4		
		4		SM	medium dense	SILTY SAND, olive-brown, fine to coarse, poorly graded, moist, subangular to subrounded, calcareous; some slightly plastic silt; little gravel; some cobbles (3.0' - 9.0').						
	2	6, 8		GC	medium dense	CLAYEY GRAVEL, olive-gray, fine to coarse, poorly graded, moist, subangular to subrounded, calcareous; some medium plastic clay; little fine to coarse sand.		49	18	33	49	19
	3	10		CL	very stiff	CLAY, olive-gray, moist, highly plastic, calcareous.		0	1	99		
	4, 5, 6	12, 14, 16, 18, 20				TOTAL DEPTH 12.0' (3.7m)						

TRENCH DETAILS

SURFACE ELEVATION	: 4840' (1475m)
DATE EXCAVATED	: 6 April 1980
SURFICIAL GEOLOGIC UNIT	: A40
TRENCH LENGTH	: 14.5' (4.4m)
TRENCH ORIENTATION	: N-S

LOG OF TRENCH WA-T-20
WAH WAH VALLEY, UTAH

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - BMO

FIGURE II-6-20

FUGRO NATIONAL, INC.

SOIL SAMPLE	DEPTH METERS	DEPTH FEET	LITHOLOGY	USCS	CONSISTENCY	SOIL DESCRIPTION	REMARKS	SIEVE ANALYSIS GR	SA	FI	LL	PI
	0 – 1	0 – 5		SM	loose	SILTY SAND, light brown, fine to coarse, poorly graded, dry, subangular to subrounded, calcareous; little nonplastic silt.	sloughing					
						TOTAL DEPTH 5.0' (1.5m)						

SURFACE ELEVATION: 4920' (1500m)
SURFICIAL GEOLOGIC UNIT: A4[illegible]/A5v

LOG OF TEST PIT WA-P-1

SOIL SAMPLE	DEPTH METERS	DEPTH FEET	LITHOLOGY	USCS	CONSISTENCY	SOIL DESCRIPTION	REMARKS	SIEVE ANALYSIS GR	SA	FI	LL	PI
	0 – 1	0 – 5		GM	dense	SANDY GRAVEL, light brown, fine to coarse, poorly graded, dry, subrounded, calcareous; some fine to coarse subangular to subrounded sand; little nonplastic silt; trace cobbles to 6" size; stage I caliche (0.5' - 5.0').	vertical walls stable	43	39	18		
						TOTAL DEPTH 5.0' (1.5m)						

SURFACE ELEVATION: 5566' (1696m)
SURFICIAL GEOLOGIC UNIT: A5i

LOG OF TEST PIT WA-P-2

LOGS OF TEST PITS WA-P-1 AND WA-P-2
WAH WAH VALLEY, UTAH

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - BMO

FIGURE II-6-21

FUGRO NATIONAL, INC.

CHECKED BY ________ APPROVED BY ________

FN-TR-27-WA-II

BULK SAMPLE	DEPTH METERS	DEPTH FEET	LITHOLOGY	USCS	CONSISTENCY	SOIL DESCRIPTION	REMARKS	SIEVE ANALYSIS GR	SA	FI	LL	PI
	0	0		ML	firm	SANDY SILT, light brown, slightly moist, slightly plastic, calcareous; some fine to coarse subrounded sand.	vertical walls stable					
	1	3		GW	medium dense	SANDY GRAVEL, dark brown, fine to coarse well graded, dry, subangular to subrounded, calcareous; some medium to coarse sand.		65	33	2		
		5				TOTAL DEPTH 5.0' (1.5m)						

SURFACE ELEVATION: 5100' (1554m)
SURFICIAL GEOLOGIC UNIT: A5y/A40

LOG OF TEST PIT WA-P-3

BULK SAMPLE	DEPTH METERS	DEPTH FEET	LITHOLOGY	USCS	CONSISTENCY	SOIL DESCRIPTION	REMARKS	GR	SA	FI	LL	PI
	0	0		SM	medium dense	SILTY SAND, light brown, fine to coarse, poorly graded, dry, subangular to subrounded, calcareous; some nonplastic silt; trace fine gravel.	vertical walls stable	8	67	25		
	1	3										
		5				TOTAL DEPTH 5.0' (1.5m)						

SURFACE ELEVATION: 5230' (1594m)
SURFICIAL GEOLOGIC UNIT: A5y

LOG OF TEST PIT WA-P-4

LOGS OF TEST PITS WA-P-3 AND WA-P-4
WAH WAH VALLEY, UTAH

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - BMO

FIGURE II-6-22

FUGRO NATIONAL, INC.

APPROVED BY ___ CHECKED BY ___

FN-TR-27-WA-II

BULK SAMPLE	DEPTH METERS	DEPTH FEET	LITHOLOGY	USCS	CONSISTENCY	SOIL DESCRIPTION	REMARKS	SIEVE ANALYSIS GR	SA	FI	LL	PI
	0 – 1.5	0 – 5		SM	medium dense	GRAVELLY SAND, light brown, fine to coarse, poorly graded, dry to slightly moist, subangular to subrounded, calcareous; some fine gravel; little nonplastic silt.	vertical walls stable	27	60	13		
						TOTAL DEPTH 5.0' (1.5m)						

SURFACE ELEVATION: 5235' (1596m)
SURFICIAL GEOLOGIC UNIT: A5y

LOG OF TEST PIT WA-P-5

BULK SAMPLE	DEPTH METERS	DEPTH FEET	LITHOLOGY	USCS	CONSISTENCY	SOIL DESCRIPTION	REMARKS	SIEVE ANALYSIS GR	SA	FI	LL	PI
	0 – 1.2	0 – 4		SM	medium dense	SILTY SAND, light brown, fine to coarse, poorly graded, dry, subangular to subrounded, calcareous; little nonplastic silt; trace fine gravel.	vertical walls stable	7	76	17		
	1.2 – 1.5	4 – 5		SP-SM	medium dense	GRAVELLY SAND, light brown, fine to coarse, poorly graded, dry, calcareous; some gravel; trace nonplastic silt.						
						TOTAL DEPTH 5.0' (1.5m)						

SURFACE ELEVATION: 5270' (1606m)
SURFICIAL GEOLOGIC UNIT: A5y

LOG OF TEST PIT WA-P-6

LOGS OF TEST PITS WA-P-5 AND WA-P-6
WAH WAH VALLEY, UTAH

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - BMO

FIGURE II-6-23

FUGRO NATIONAL, INC.

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USAF-38

BULK SAMPLE	DEPTH METERS	DEPTH FEET	LITHOLOGY	USCS	CONSISTENCY	SOIL DESCRIPTION	REMARKS	SIEVE ANALYSIS GR	SA	FI	LL	PI
	0	0–2		ML	firm	SANDY SILT, light brown, dry, slightly plastic, calcareous; some fine to medium subangular to subrounded sand.	vertical walls stable	2	48	50		
	1	2–5		SW-SM	medium dense	GRAVELLY SAND, gray-brown, fine to coarse, well graded, dry, subangular to subrounded, calcareous; little fine gravel; trace nonplastic silt.		19	74	7		
		5				TOTAL DEPTH 5.0' (1.5m)						

SURFACE ELEVATION: 4960' (1508m)
SURFICIAL GEOLOGIC UNIT: A5y

LOG OF TEST PIT WA-P-7

BULK SAMPLE	DEPTH METERS	DEPTH FEET	LITHOLOGY	USCS	CONSISTENCY	SOIL DESCRIPTION	REMARKS	SIEVE ANALYSIS GR	SA	FI	LL	PI
	0–1	0–5		SM	medium dense	SILTY SAND, light brown, fine to coarse, poorly graded, dry, subrounded, calcareous; little nonplastic silt.	vertical walls stable	3	78	19		
		5				TOTAL DEPTH 5.0' (1.5m)						

SURFACE ELEVATION: 4770' (1454m)
SURFICIAL GEOLOGIC UNIT: A5y/A40

LOG OF TEST PIT WA-P-8

LOGS OF TEST PITS WA-P-7 AND WA-P-8
WAH WAH VALLEY, UTAH

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FIGURE II-6-24

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BULK SAMPLE	DEPTH METERS	DEPTH FEET	LITHOLOGY	USCS	CONSISTENCY	SOIL DESCRIPTION	REMARKS	SIEVE ANALYSIS GR	SA	FI	LL	PI
	0–1	0–5		SM	medium dense	SILTY SAND, light brown, fine to coarse, poorly graded, dry to moist, subrounded, calcareous; some nonplastic silt; trace fine gravel.	vertical walls stable	11	56	33		
						TOTAL DEPTH 5.0' (1.5m)						

SURFACE ELEVATION: 4756' (1449m)
SURFICIAL GEOLOGIC UNIT: A40/A5y

LOG OF TEST PIT WA-P-9

BULK SAMPLE	DEPTH METERS	DEPTH FEET	LITHOLOGY	USCS	CONSISTENCY	SOIL DESCRIPTION	REMARKS	GR	SA	FI	LL	PI
	0–1	0–3.5		CL	firm	SILTY CLAY, light brown, slightly moist, slightly plastic, calcareous.	vertical walls stable					
		3.5–5		ML	firm	SILT, light brown, dry, nonplastic, calcareous; trace fine subrounded sand; stage II caliche (3.5' - 5.0').						
						TOTAL DEPTH 5.0' (1.5m)						

SURFACE ELEVATION: 4640' (1414m)
SURFICIAL GEOLOGIC UNIT: A4

LOG OF TEST PIT WA-P-10

LOGS OF TEST PITS WA-P-9 AND WA-P-10
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FIGURE II-6-25

FUGRO NATIONAL, INC.

BULK SAMPLE	DEPTH METERS	DEPTH FEET	LITHOLOGY	USCS	CONSISTENCY	SOIL DESCRIPTION	REMARKS	SIEVE ANALYSIS GR	SA	FI	LL	PI
	0	0 – 5		GM	dense	SANDY GRAVEL, light brown, fine to coarse, poorly graded, dry to slightly moist, subangular, calcareous; some fine to coarse sand; some non-plastic silt; trace cobbles to 8" size; stage I caliche (0.5' - 5.0').	vertical walls stable	38	35	27		
						TOTAL DEPTH 5.0' (1.5m)						

SURFACE ELEVATION: 5035' (1535m)
SURFICIAL GEOLOGIC UNIT: A40/A5y

LOG OF TEST PIT WA-P-11

BULK SAMPLE	DEPTH METERS	DEPTH FEET	LITHOLOGY	USCS	CONSISTENCY	SOIL DESCRIPTION	REMARKS	SIEVE ANALYSIS GR	SA	FI	LL	PI
	0	0 – 4		SM	medium dense	SILTY SAND, brown, fine to coarse, poorly graded, moist, subrounded, calcareous; some non-plastic silt; little fine subangular to subrounded gravel.	vertical walls stable	16	44	40		NP
		4 – 5		GP-GM	medium dense	SANDY GRAVEL, brown, fine to coarse, poorly graded, moist, subangular to subrounded, calcareous; some fine to coarse sand; trace nonplastic silt.		56	37	7		
						TOTAL DEPTH 5.0' (1.5m)						

SURFACE ELEVATION: 5080' (1548m)
SURFICIAL GEOLOGIC UNIT: A5y/A40

LOG OF TEST PIT WA-P-12

LOGS OF TEST PITS WA-P-11 AND WA-P-12
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FIGURE II-6-26

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BULK SAMPLE	DEPTH METERS	DEPTH FEET	LITHOLOGY	USCS	CONSISTENCY	SOIL DESCRIPTION	REMARKS	SIEVE ANALYSIS GR	SA	FI	LL	PI
	0	0		SM	dense	GRAVELLY SAND, gray, fine to coarse, poorly graded, dry, subangular to subrounded, calcareous; some fine to coarse gravel; little nonplastic silt; trace cobbles and boulders to 20" size; stage III caliche (0.5' - 2.5').	vertical walls stable					
		1										
		2			very dense							
						TOTAL DEPTH 2.5 (0.8m)	cementation at 2.5' exceeded capacity of Case 580C backhoe					
	1	3										
		4										
		5										

SURFACE ELEVATION: 5595' (1706m)
SURFICIAL GEOLOGIC UNIT: A5i/A5y

LOG OF TEST PIT WA-P-13

BULK SAMPLE	DEPTH METERS	DEPTH FEET	LITHOLOGY	USCS	CONSISTENCY	SOIL DESCRIPTION	REMARKS	GR	SA	FI	LL	PI
	0	0		SM	medium dense	SILTY SAND, light brown, fine to coarse, poorly graded, slightly moist, subangular to subrounded, calcareous; some nonplastic silt; some fine gravel.	vertical walls stable	24	42	34		
		1										
		2										
	1	3										
		4										
		5				TOTAL DEPTH 5.0' (1.5m)						

SURFACE ELEVATION: 4956' (1510m)
SURFICIAL GEOLOGIC UNIT: A5y/A40

LOG OF TEST PIT WA-P-14

LOGS OF TEST PITS WA-P-13 AND WA-P-14
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FIGURE II-6-27

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BULK SAMPLE	DEPTH METERS	DEPTH FEET	LITHOLOGY	USCS	CONSISTENCY	SOIL DESCRIPTION	REMARKS	SIEVE ANALYSIS GR	SA	FI	LL	PI
	0	0–3		SM	dense	GRAVELLY SAND, gray, fine to coarse, poorly graded, dry, subangular to subrounded, calcareous; some fine gravel; little nonplastic silt.	vertical walls stable	26	54	20		
	1	3–5		SW	dense	GRAVELLY SAND, light brown, fine to coarse, well graded, dry, subangular to subrounded, calcareous; little fine gravel.		18	79	3		
						TOTAL DEPTH 5.0' (1.5m)						

SURFACE ELEVATION: 4735' (1443m)
SURFICIAL GEOLOGIC UNIT: A5y/A40

LOG OF TEST PIT WA-P-15

BULK SAMPLE	DEPTH METERS	DEPTH FEET	LITHOLOGY	USCS	CONSISTENCY	SOIL DESCRIPTION	REMARKS	GR	SA	FI	LL	PI
	0–1	0–5		CL-ML	firm	SILTY CLAY, light brown, slightly moist, slightly plastic, calcareous; trace fine subrounded sand.	vertical walls stable	0	10	90	28	6
						TOTAL DEPTH 5.0' (1.5m)						

SURFACE ELEVATION: 4655' (141[illegible])
SURFICIAL GEOLOGIC UNIT: A40

LOG OF TEST PIT WA-P-16

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LOGS OF TEST PITS WA-P-15 AND WA-P-16
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FIGURE II-6-28

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USAF-30

BULK SAMPLE	DEPTH METERS	DEPTH FEET	LITHOLOGY	USCS	CONSISTENCY	SOIL DESCRIPTION	REMARKS	SIEVE ANALYSIS GR	SA	FI	LL	PI
	0	0		SM	loose	Interbedded layers of SILTY SAND and SANDY GRAVEL: SILTY SAND (SM): light olive to brown, fine to medium, poorly graded, dry to slightly moist, calcareous; some nonplastic silt. SANDY GRAVEL (GP): brown, fine to coarse, poorly graded, dry, subangular to rounded, calcareous; some fine to coarse sand.	vertical walls stable	2	76	22		NP
		2		GP	dense							
	1	3 – 5		SM	medium dense							
		5				TOTAL DEPTH 5.0' (1.5m)						

SURFACE ELEVATION: 4750' (1448m)
SURFICIAL GEOLOGIC UNIT: A40

LOG OF TEST PIT WA-P-17

BULK SAMPLE	DEPTH METERS	DEPTH FEET	LITHOLOGY	USCS	CONSISTENCY	SOIL DESCRIPTION	REMARKS	SIEVE ANALYSIS GR	SA	FI	LL	PI
	0	0		SP-SM	medium dense	SAND, light brown, fine to medium, poorly graded, dry, subangular to subrounded, calcareous; trace nonplastic silt.	vertical walls stable	1	91	8		
	1	3.5		SM	medium dense	SILTY SAND, light brown, fine to coarse, poorly graded, dry, subangular to subrounded, calcareous; some nonplastic silt; little fine to coarse gravel.		15	39	46		
		5				TOTAL DEPTH 5.0' (1.5m)						

SURFACE ELEVATION: 4720' (1439m)
SURFICIAL GEOLOGIC UNIT: A40

LOG OF TEST PIT WA-P-18

LOGS OF TEST PITS WA-P-17 AND WA-P-18
WAH WAH VALLEY, UTAH

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FIGURE II-6-29

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BULK SAMPLE	DEPTH METERS	DEPTH FEET	LITHOLOGY	USCS	CONSISTENCY	SOIL DESCRIPTION	REMARKS	SIEVE ANALYSIS GR	SA	FI	LL	PI
	0	0–2.5		GP-GM	medium stiff	SANDY GRAVEL, brown to red brown, fine to coarse, poorly graded, dry, subangular to rounded, calcareous; some fine to coarse sand; trace silt; some cobbles and boulders; stage I caliche (0.5' - 2.5').	vertical walls stable					
	1	2.5–5		CL	stiff	SILTY CLAY, olive, slightly moist, slightly to medium plastic, calcareous.						
		5				TOTAL DEPTH 5.0' (1.5m)						

SURFACE ELEVATION: 4720' (1439m)
SURFICIAL GEOLOGIC UNIT: A40

LOG OF TEST PIT WA-P-19

BULK SAMPLE	DEPTH METERS	DEPTH FEET	LITHOLOGY	USCS	CONSISTENCY	SOIL DESCRIPTION	REMARKS	GR	SA	FI	LL	PI
	0	0–2.5		SM	medium dense	SILTY SAND, light brown, fine to medium, poorly graded, moist, subangular to subrounded, calcareous; little nonplastic silt.	sloughing	1	79	20		NP
	1	2.5–5		SP	medium dense	SAND, white to light gray, fine to coarse, poorly graded, dry, subangular to subrounded; trace fine gravel.						
		5				TOTAL DEPTH 5.0' (1.5m)						

SURFACE ELEVATION: 4720' (1439m)
SURFICIAL GEOLOGIC UNIT: A40

LOG OF TEST PIT WA-P-20

LOGS OF TEST PITS WA-P-19 AND WA-P-20
WAH WAH VALLEY, UTAH

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FIGURE II-6-30

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7.0 SURFICIAL SAMPLE LOGS

Explanation: Finalized logs of the surficial samples are presented in this section. Explanations of the column headings on the logs are as follows:

A. Designations - Surficial samples are identified as follows:

WA-CS-1
WA - abbreviation for the valley (e.g., WA - Wah Wah)
CS - abbreviation for surficial sample
1 - number of activity

B. Ground Surface Elevation - Indicated elevations on the logs are estimated from topographic maps of the study area within an accuracy of half the contour interval.

C. Surficial Geologic Unit - Indicates the surficial geologic unit in which the activity is located.

D. Depth - Indicates depth interval for which soil description is given.

E. USCS - Unified Soil Classification Symbol; see Table II-5-1 of Section 5.0, "Boring Logs," for details of USCS.

F. Soil Description - Soil is described based on field visual descriptions and/or laboratory test results. See Section 5.0, "Boring Logs," for procedures of soil description.

G. Sieve Analysis, LL and PI - These are from results of laboratory tests. See Section 5.0, "Boring Logs," for explanation.

ACTIVITY NUMBER	GROUND SURFACE ELEVATION, FEET (METERS)	SURFICIAL GEOLOGIC UNIT	DEPTH, FEET (METERS)	USCS	SOIL DESCRIPTION	SIEVE ANALYSIS GR	SA	FI	LL	PI
WA-CS-1	4835 (1474)	A40/A5y	0.0 - 2.0 (0.0 - 0.6)	SP-SM	SAND, light brown, fine to medium, poorly graded, subangular to subrounded, calcareous; trace nonplastic silt.					
WA-CS-4	5020 (1530)	A40/A5y	0.0 - 2.0 (0.0 - 0.6)	SM	SILTY SAND, light brown, fine to coarse, poorly graded, angular to subrounded, calcareous; little nonplastic silt.					
WA-CS-5	5435 (1657)	A5i	0.0 - 3.0 (0.0 - 0.9)	SM	GRAVELLY SAND, light brown, fine to coarse, poorly graded, subangular, calcareous; some fine to coarse gravel; little nonplastic silt; little cobbles to 10" size; stage I caliche (0.5' - 3.0').					
WA-CS-8	4960 (1512)	A5y/A40	0.0 - 2.0 (0.0 - 0.6)	SM	SILTY SAND, light brown, fine to coarse, poorly graded, subrounded, calcareous; some nonplastic silt; little fine gravel.	14	40	46		
			2.0 - 3.0 (0.6 - 0.9)	GP-GM	SANDY GRAVEL, light brown, fine, poorly graded, subrounded, calcareous; some fine to coarse sand; trace nonplastic silt; occasional cobbles to 6" size.	61	30	9		
WA-CS-10	4920 (1500)	A40/A5y	0.0 - 3.0 (0.0 - 0.9)	ML	SANDY SILT, light brown, slightly plastic, calcareous; some fine to coarse subrounded sand.					
WA-CS-11	4975 (1516)	A40/A5y	0.0 - 3.0 (0.0 - 0.9)	SC	CLAYEY SAND, light brown, fine to coarse, poorly graded, subrounded, calcareous; some slightly plastic clay; trace fine gravel.	8	56	36	28	12
WA-CS-13	6000 (1829)	A40/A5y	0.0 - 3.0 (0.0 - 0.9)	SM	SILTY SAND, light brown, fine to coarse, poorly graded, subangular to subrounded, calcareous; some nonplastic silt.					
WA-CS-15	5335 (1626)	A5y	0.0 - 2.5 (0.0 - 0.8)	SM	SILTY SAND, light brown, fine to coarse, poorly graded, subangular to subrounded, calcareous; some nonplastic silt; trace fine gravel; stage II caliche (1.0' - 2.5').					
			2.5 - 3.0 (0.8 - 0.9)	SP	GRAVELLY SAND, light brown, fine to coarse, poorly graded, subangular to subrounded, calcareous; little fine gravel.					
WA-CS-18	5395 (1644)	A5i	0.0 - 3.0 (0.0 - 0.9)	SM	SILTY SAND, light brown, fine to coarse, poorly graded, subangular to subrounded, calcareous; some slightly plastic silt.					
WA-CS-20	5230 (1594)	A5i	0.0 - 3.0 (0.0 - 0.9)	SM	SILTY SAND, light brown, fine to coarse, poorly graded, subangular to subrounded, calcareous; some slightly plastic silt; trace fine gravel.	7	63	30		
WA-CS-23	5365 (1635)	A5y	0.0 - 3.0 (0.0 - 0.9)	SM	SILTY SAND, light brown, fine to coarse, poorly graded, subangular to subrounded, calcareous; little nonplastic silt; trace fine gravel.					

LOGS OF SURFICIAL SOIL SAMPLES
WAH WAH VALLEY, UTAH

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FIGURE II-7-1
1 OF 3

FUGRO NATIONAL, INC.

ACTIVITY NUMBER	GROUND SURFACE ELEVATION, FEET (METERS)	SURFICIAL GEOLOGIC UNIT	DEPTH, FEET (METERS)	USCS	SOIL DESCRIPTION	SIEVE ANALYSIS GR	SA	FI	LL	PI
WA-CS-26	5560 (1696)	A5y	0.0 - 3.0 (0.0 - 0.9)	SM	SILTY SAND, light brown, fine to coarse, poorly graded, subangular to subrounded, calcareous; little nonplastic silt; little fine gravel.					
WA-CS-28	5110 (1558)	A5y/A40	0.0 - 3.0 (0.0 - 0.9)	SM	SILTY SAND, light brown, fine to coarse, poorly graded, subangular to subrounded, calcareous; some nonplastic silt; little fine gravel.	20	56	24		
WA-CS-30	5196 (1583)	A5i	0.0 - 3.0 (0.0 - 0.9)	SM	GRAVELLY SAND, light brown, fine to coarse, poorly graded, subangular to subrounded, calcareous; some fine to coarse gravel; some nonplastic silt; trace cobbles to 10" size.	37	37	26		
WA-CS-32	4875 (1486)	A5y	0.0 - 3.0 (0.0 - 0.9)	SP-SM	SAND, light brown, fine to coarse, poorly graded, subangular to subrounded, calcareous; trace nonplastic silt; trace fine gravel.					
WA-CS-34	4760 (1451)	A40	0.0 - 2.5 (0.0 - 0.8)	SM	SILTY SAND, light brown, fine to coarse, poorly graded, subrounded, calcareous; some nonplastic silt; trace fine gravel.					
			2.5 - 3.0 (0.8 - 0.9)	SW	GRAVELLY SAND, gray, fine to coarse, well graded, calcareous; some fine to coarse gravel; stage I caliche.	44	54	2		
WA-CS-37	4920 (1500)	A5y/A40	0.0 - 3.0 (0.0 - 0.9)	GM	SANDY GRAVEL, light brown, fine to coarse, poorly graded, subangular to subrounded, calcareous; some fine to coarse sand; little nonplastic silt; little cobbles to 10" size.	60	26	14		
WA-CS-41	4706 (1434)	A5y/A40	0.0 - 3.0 (0.0 - 0.9)	SM	SILTY SAND, light brown to brown, fine to coarse, poorly graded, subangular to subrounded, calcareous; some nonplastic silt; some fine subangular gravel; occasional cobbles to 6" size.	24	46	30		
WA-CS-43	4665 (1422)	A40/A5y	0.0 - 3.0 (0.0 - 0.9)	SM	SILTY SAND, gray, fine to medium, poorly graded, subrounded, calcareous; little nonplastic silt.	3	79	18		
WA-CS-46	4690 (1430)	A40/A5y	0.0 - 3.0 (0.0 - 0.9)	SM	SILTY SAND, light brown, fine to coarse, poorly graded, subangular to subrounded, calcareous; some nonplastic silt.					
WA-CS-47	4640 (1414)	A4	0.0 - 3.0 (0.0 - 0.9)	ML	SILT, light brown, slightly plastic, calcareous.	0	0	100	34	6
WA-CS-48	4700 (1433)	A5y/A40	0.0 - 3.0 (0.0 - 0.9)	SM	SILTY SAND, light brown, fine to medium, poorly graded, subrounded, calcareous; some nonplastic silt.	0	71	29		
WA-CS-52	4890 (1490)	A5i/A40	0.0 - 3.0 (0.0 - 0.9)	GM	SANDY GRAVEL, light brown, fine to coarse, poorly graded, subangular to subrounded, calcareous; some fine to coarse sand; little nonplastic silt; occasional cobbles to 5" size.	55	30	15		

LOGS OF SURFICIAL SOIL SAMPLES
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FIGURE II-7-1
2 OF 3

FUGRO NATIONAL, INC.

ACTIVITY NUMBER	GROUND SURFACE ELEVATION, FEET (METERS)	SURFICIAL GEOLOGIC UNIT	DEPTH, FEET (METERS)	USCS	SOIL DESCRIPTION	SIEVE ANALYSIS GR	SA	FI	LL	PI
WA-CS-54	5015 (1529)	A5y/A40	0.0 - 3.0 (0.0 - 0.9)	SM	SILTY SAND, light brown, fine to coarse, poorly graded, subangular to subrounded, calcareous; some nonplastic silt; trace fine gravel.					
WA-CS-56	5160 (1573)	A5y/A40	0.0 - 3.0 (0.0 - 0.9)	SM	GRAVELLY SAND, light brown, fine to coarse, poorly graded, subangular to subrounded, calcareous; some fine to coarse gravel; little nonplastic silt; stage I caliche (0.5' - 3.0').					
WA-CS-58	5450 (1661)	A5i/A5y	0.0 - 2.5 (0.0 - 0.8)	SM	GRAVELLY SAND, grey, fine to coarse, poorly graded, subangular to subrounded, calcareous; some fine to coarse gravel; some nonplastic silt; stage III caliche (0.5' - 2.5').					
WA-CS-61	4675 (1425)	A40	0.0 - 2.0 (0.0 - 0.6)	SM	SILTY SAND, light brown, fine to medium, poorly graded, subangular to subrounded, calcareous; little nonplastic silt.					
WA-CS-63	4680 (1426)	A40	0.0 - 2.0 (0.0 - 0.6)	SM	SILTY SAND, light brown, fine to medium, poorly graded, subangular to subrounded, calcareous; little nonplastic silt.					
WA-CS-65	4730 (1442)	A40	0.0 - 0.8 (0.0 - 0.2)	SM	GRAVELLY SAND, brown, fine to coarse, poorly graded, subangular to rounded, calcareous; some fine to coarse gravel; some nonplastic silt; some cobbles and boulders.					
			0.8 - 2.0 (0.2 - 0.6)	CL	CLAY, light olive, medium plastic, calcareous.					
WA-CS-67	4730 (1442)	A40	0.0 - 2.0 (0.0 - 0.6)	SM	SILTY SAND, brown, fine to coarse, poorly graded, subangular to subrounded, calcareous; some nonplastic silt; occasional cobbles and boulders.	4	68	28		
WA-CS-69	4760 (1451)	A40	0.0 - 1.0 (0.0 - 0.3)	SM	SILTY SAND, brown, fine to coarse, poorly graded, subangular to subrounded, calcareous; some slightly plastic silt.	0	73	27		
			1.0 - 2.0 (0.3 - 0.6)	CH	CLAY, light olive, highly plastic, calcareous.	0	1	99	56	31
WA-CS-71	4720 (1439)	A40	0.0 - 1.5 (0.0 - 0.5)	SM	SILTY SAND, brown, fine to coarse, poorly graded, subangular to subrounded, calcareous; some nonplastic silt.	0	64	36		
			1.5 - 2.0 (0.5 - 0.6)	ML	SANDY SILT, white, nonplastic to slightly plastic, calcareous; some fine to medium subangular to subrounded sand.					

LOGS OF SURFICIAL SOIL SAMPLES
WAH WAH VALLEY, UTAH

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FIGURE II-7-1
3 OF 3

FUGRO NATIONAL, INC.

8.0 LABORATORY TEST RESULTS

Explanation: Table II-8-1 contains a summary of laboratory test results. This table contains results of sieve analysis; plasticity data; in-situ dry unit weight, moisture content, degree of saturation, and void ratio for drive and Pitcher samples; results of compaction tests; and specific gravity of solids. Other tests such as triaxial compression, unconfined compression, direct shear, consolidation, chemical, and California Bearing Ratio (CBR) are indicated on the table. Tables II-8-2 through II-8-6 and Figures II-8-1 and II-8-3 present results of triaxial compression, unconfined compression, direct shear, consolidation, chemical, and CBR tests.

All tests were performed in general accordance with the American Society for Testing and Materials (ASTM) procedures. The following list presents the ASTM designations for the tests performed during the investigation.

Type of Test	ASTM Designations
Particle Size Analysis	D 422-63
Liquid Limit	D 423-66
Plastic Limit	D 424-59
Unit Weight	D 2937-71
Moisture Content	D 2216-71
Compaction	D 1557-70
Specific Gravity of Solids	D 854-58
Triaxial	D 2850-70
Unconfined Compression	D 2166-66
Direct Shear	D 3080-72
Consolidation	D 2435-70
Test for Alkalinity (pH)	D 1067-70
Water Soluble Sodium	D 1428-64
Water Soluble Chloride	D 512-67
Water Soluble Sulphate	D 516-68
Water Soluble Calcium	D 511-72
Calcium Carbonate	D 1126-67
California Bearing Ratio (CBR)	D 1883-73

Explanation for the tables and figures presented in this section are as follows:

A. Activity Number - Boring, trench, test pit, or surficial sample designation.

B. Sample Number - Prefix indicates the type of sample; explanation is at the bottom of the table.

C. Sample Interval - This is the depth range measured from ground surface over which the sample was obtained.

D. Percent Finer by Weight - Presents the results of laboratory particle-size analysis (ASTM D 422-63) performed on representative soil samples at the depth indicated. The numbers represent the percent (by dry weight) of the total sample weight passing through each sieve size indicated.

E. Atterberg Limits (ASTM D 423-66 and D 424-59)

LL - Liquid Limit, the water content (as percent of soil dry weight) corresponding to the arbitrary limit between the liquid and plastic states of consistency of a soil (ASTM D 423-66).

PL - Plastic Limit, the water content corresponding to an arbitrary limit between the plastic and the semisolid state of consistency of a soil (ASTM D 424-59).

PI - Plasticity Index, numerical difference between the liquid limit (LL) and the plastic limit (PL) indicating the range of moisture content within which a soil-water mixture is plastic.

NP - Nonplastic.

F. USCS - Unified Soil Classification Symbols are given here; see Table II-5-1 in Section 5.0, "Boring Logs," for complete details of USCS system.

G. In Situ - Presents results of tests on drive and Pitcher samples.

Dry Unit Weight - indicates dry unit weight of soil determined as per ASTM D 2937-71.

Moisture Content - weight of water reported in percent of dry weight of soil sample (ASTM D 2216-71).

Saturation - the degree of saturation in a soil sample is defined as the ratio (in percent) of the volume of water to the volume of all voids in the soil.

Void Ratio - the numerical ratio of the volume of voids to the volume of solids in a soil specimen.

H. Compacted - Indicates results of laboratory maximum dry density and optimum moisture content test as per ASTM D 1557-70.

I. Specific Gravity of Solids (ASTM D 854-58) - Indicates the ratio of 1) the weight in air of a given volume of soil solids at a stated temperature, to 2) the weight in air of an equal volume of distilled water at a stated temperature.

J. Triaxial - The triaxial compression tests were performed in accordance with the procedures of ASTM D 2850-70. The following explanations and definitions apply.

Triaxial Compression Test - a cylindrical specimen of soil is surrounded by a fluid in a pressure chamber and subjected to an isotropic pressure. An additional compressive load is then applied, directed along the axis of the specimen called the axial load.

Consolidated-Drained (CD) Test - a triaxial compression test in which the soil was first consolidated under an all-around confining stress (test chamber pressure) and was then compressed (and hence sheared) by increasing the vertical stress. "Drained" indicates that excess pore water pressure generated by strains are permitted to dissipate by

the free movement of pore water during consolidation and compression.

Consolidated-Undrained (CU) Test - a triaxial compression test in which essentially complete consolidation under the confining (chamber) pressure is followed by a shear test at constant water content.

Confining Pressure (σ_3) - the isotropic chamber pressure applied to the soil specimen during consolidation and compression.

Maximum Deviator Stress ($\sigma_1-\sigma_3$) - the difference between the major and minor principal stresses in the specimen at failure. The major principal stress on the specimen is equal to the unit axial load plus the chamber pressure, and the minor principal stress on the specimen is equal to the chamber pressure.

Strain Rate - axial strain, ε, at a given stress level is defined as the ratio of the change in length (ΔL) of the specimen to the original length of the specimen (L_o). The rate of strain was controlled during the test so that this ratio increased at equal increments for each minute of testing.

Back Pressure - pressure in excess of atmospheric applied to the pore water of a soil sample. Back pressure is usually applied to 1) increase saturation of the sample, or 2) simulate the actual in-situ pressure regime.

K. Unconfined Compression - Test procedures were as described in ASTM D 2166-66. Unconfined compressive strength is defined as the load per unit area at which an unconfined prismatic or cylindrical specimen of soil will fail in a simple compression test. In these methods, unconfined compressive strength is taken as the maximum load attained per unit area or the load per unit area at 20 percent axial strain, whichever occurred first during the performance of a test.

L. Direct Shear - The procedures of ASTM D 3080-72 were followed for direct shear testing. In this test, soil under an

applied normal load is stressed to failure by moving one section of the soil container (shear box) relative to the other section. Normal stress is the value of load per unit area acting perpendicular to the plane of shearing. Maximum shear strength is defined as the maximum resistance (ksf) of a soil to shearing (tangential) stresses.

M. Consolidation (ASTM D 2435-70) - A consolidation test is a test in which a cylindrical soil specimen is laterally confined in a ring and compressed between porous plates. The term "consolidation," as used here, indicates the gradual reduction in volume of the soil mass resulting from an increase in compressive stress (axial load per unit area).

N. Chemical - The chemical tests performed on soil samples included: pH; water soluble sodium, chloride, sulphate, calcium; and calcium carbonate content. pH is an index of the acidity or alkalinity of a soil in terms of the logarithm of the reciprocal of the hydrogen ion concentration. ASTM test procedure designations for these chemical tests are included in the list on the first page of these Explanations.

O. CBR - California Bearing Ratio (CBR) is the ratio (in percent) of the resistance to penetration developed by a subgrade soil to that developed by a standard crushed-rock base material. The procedures for conducting a CBR test were as outlined in ASTM D 1883-73. The materials tested

for CBR were also analyzed for particle-size distribution (ASTM D 422-63) and compaction characteristics (ASTM D 1557-70). The term "percentage of maximum density" indicates the ratio (as a percentage) of the compacted sample dry unit weight to maximum dry density obtained in the laboratory from ASTM D 1557-70, "Moisture-Density Relations of Soils Using 10-pound (4.5-kg) Hammer and 18-inch (457-mm) Drop."

ACTIVITY NUMBER	SAMPLE NUMBER (a)	SAMPLE INTERVAL		PERCENT FINER BY WEIGHT										
				STANDARD SIEVE OPENING							U S STANDARD SIEVE			
				BLDRS.	COBBLES		GRAVEL				SAND			
		FEET	METERS	24"	12"	6"	3"	1½"	3/4"	3/8"	4	10	40	100
WA-B-1	P 1	0.9 1.7	0.27 0.52					100	99	93	84	75	58	32
	P 2	4.0 5.0	1.22 1.52						100	98	95	[illegible]	82	46
	D 3	6.7 7.4	2.04 2.26						100	98	93	86	70	39
	P 4	10.9 11.7	3.32 3.57									100	99	94
	P-5	15.6 16.2	4.75 4.94											
	P-6	20.6 21.1	6.28 6.43											
	P 7	25.0 25.9	7.62 7.89											
	P-7	25.9 26.8	7.89 8.17											
	P-7	25.9 26.8	7.89 8.17											
	P 7	26.8 27.5	8.17 8.38											
	P 8	30.7 31.4	9.36 9.57											
	P 9	40.9 41.7	12.47 12.71											
	P 10	50.0 50.7	15.24 15.45											
	P 11	60.2 60.9	18.35 18.56											
	P 12	70.0 70.4	21.34 21.46									100	96	83
	P-12	70.4 70.8	21.46 21.58						100	89	69	52	28	16
	P 13	80.5 81.3	24.54 24.78						100	95	90	88	79	57
	P-13	81.3 82.1	24.78 25.02											
	P-13	81.3 82.1	24.78 25.02											
	P-13	82.1 82.9	25.02 25.27											
	P 14	90.0 90.5	27.43 27.58					100	69	64	57	51	38	26
	P 16	110.0 110.9	33.53 33.80							100	99	98	[illegible]	45
	P 17	120.0 120.9	36.58 36.85											
	D 18	140.0 140.5	42.67 42.82						100	98	74	49	23	15
	D 19	159.5 159.9	48.62 48.74											
WA B 2	P-1	0.9 1.8	0.27 0.55									100	97	84
	P 2	3.0 3.5	0.91 1.07											
	P-2	3.9 4.7	1.19 1.43								100	99	97	94
	P 3	6.9 7.5	2.10 2.29									100	99	97
	P 4	10.9 11.8	3.32 3.60											
	b-5	16.0 16.5	4.88 5.03						100	72	55	39	23	12
	D 7	25.2 25.9	7.68 7.89											
	D 8	30.7 31.4	9.36 9.57											
	D-8	30.7 31.4	9.36 9.57											
	P 9	40.8 41.3	12.44 12.59											
	P 10	50.9 51.8	15.51 15.79											
	P 11	60.0 61.7	18.29 18.81											
	P 12	70.0 70.5	21.34 21.49											
	P-12	70.9 71.4	21.61 21.76											
	P-12	70.9 71.8	21.61 21.88											
	P-12	71.8 72.3	21.88 22.04											
	P 13	80.9 81.7	24.36 24.90											

NOTES:

(a) Sample types
- SS – Standard split spoon
- P – Pitcher
- D – Fugro Drive
- B,b – Bulk

(b) NP – Not Plastic

(c) USCS – Unified Soil Classification System

(d) * Indicates that test has been performed and results are included in this report

ER BY WEIGHT											IN-SITU					COMPACTED			
U S STANDARD SIEVE NO.					PARTICLE SIZE (mm)		ATTERBERG LIMITS (b)			USCS (c)	DRY UNIT WEIGHT		MOISTURE CONTENT (%)	SATURATION (%)	VOID RATIO	MAXIMUM DRY DENSITY		OPTIMUM MOISTURE (%)	SPECIFIC GRAVITY OF SOLIDS
SAND				SILT OR CLAY															
4	10	40	100	200	.005	.001	LL	PL	PI		(pcf)	(kg/m³)				(pcf)	(kg/m³)		
84	75	58	32	25						SM	88.8	1424	5.0	15.2	0.90				
95	92	82	46	25						SM	104.5	1674	7.0	30.9	0.61				
93	86	70	39	25						SM	118.5	1898	5.5	35.4	0.42				
	100	99	94	91	80	47	65	21	44	CH	91.4	1464	29.2	93.5	0.84				
										CH	104.5	1674	19.4	85.5	0.61				
										CH	103.9	1664	24.6	100.0	0.62				
				100	91	60				CH	103.7	1661	22.0	95.1	0.62				
							64	22	42	CH	104.5	1674	22.9	100.0	0.61				
										CH	105.6	1692	18.6	84.2	0.60				
										CH	109.7	1757	18.6	93.6	0.54				
				100			67	21	46	CH	109.4	1753	20.7	100.0	0.54				
										CH	108.5	1738	18.5	90.3	0.55				
										CH	107.4	1721	19.4	92.2	0.57				
										CH	114.1	2308	2.9	16.3	0.48				
	100	96	83	79			57	27	30	CH									
69	52	28	16	13						SM									
90	88	79	57	37			25	14	11	SC	109.4	1753	13.8	69.0	0.54				
										SC	110.1	1764	12.6	63.9	0.53				
										SC	110.2	1765	13.4	68.5	0.53				
										SC	111.6	1788	15.7	83.3	0.51				
57	51	38	26	23			48	19	29	GC			15.7						2.75
99	98	91	45	26						SC	100.2	1605	9.0	35.6	0.68				
										SC	104.4	1672	17.9	78.8	0.61				
74	49	23	15	12						SP SM	130.3	2087	8.8	81.3	0.29				
										SM	112.5	1802	10.0	54.4	0.50				
	100	97	84	75			32	27	5	ML	74.0	1185	11.3	23.9	1.28				
										MH	103.2	1653	24.0	100.0	0.63				
100	99	97	94	92			57	38	19	MH	68.3	1094	15.7	28.9	1.47				
	100	99	97	96			47	30	17	ML	71.0	1137	19.3	37.0	1.46				2.80
										ML	87.4	1400	9.8	28.4	0.93				
55	39	23	12	9						SW SM									
										SW SM	120.1	1924	6.0	40.2	0.40				
				100			64	22	42	CH	94.0	1506	28.8	98.1	0.79				
										CH	92.3	1479	31.9	104.4	0.83				
										CH	95.9	1536	27.7	99.1	0.76				
										CH	96.1	1540	27.2	97.5	0.75				
				100			64	22	42	CH	94.2	1509	28.0	95.8	0.79				
										CH	89.6	1435	32.9	100.9	0.88				
										CH	92.9	1488	30.8	102.3	0.81				
				100	94	62				CH	90.1	1443	34.5	107.2	0.87				
							56	27	29	CH	92.5	1482	31.6	103.9	0.82				
										CH	99.9	1600	25.7	100.9	0.69				

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SATURATION (%)	VOID RATIO	COMPACTED MAXIMUM DRY DENSITY (pcf)	COMPACTED MAXIMUM DRY DENSITY (kg/m³)	COMPACTED OPTIMUM MOISTURE (%)	SPECIFIC GRAVITY OF SOLIDS	TRIAXIAL (d)	UNCONFINED COMPRESSION	DIRECT SHEAR	CONSOLIDATION	CHEMICAL	CBR
15.2	0.90										
30.9	0.61										
35.4	0.42									*	
93.5	0.84							*			
85.5	0.61										
100.0	0.62										
95.1	0.62					*					
100.0	0.61										
84.2	0.60					*					
63.6	0.54					*					
100.0	0.54										
90.3	0.55										
92.2	0.57										
16.3	0.48										
69.0	0.54					*					
63.9	0.53										
68.5	0.53					*					
83.3	0.51					*					
					2.75						
35.6	0.68										
78.8	0.61										
81.3	0.29										
54.4	0.50										
23.9	1.28										
100.0	0.63						*				
28.9	1.47										
37.0	1.46				2.80						
28.4	0.93										
40.2	0.40										
98.1	0.79										
104.4	0.83								*		
99.1	0.76										
97.5	0.75										
95.8	0.79									*	
100.9	0.88					*					
102.3	0.81					*					
107.2	0.87										
103.9	0.82					*					
100.9	0.69										

SUMMARY OF LABORATORY TEST RESULTS
WAH WAH VALLEY, UTAH

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - BMO

TABLE II 8-1
1 OF 2

FUGRO NATIONAL, INC.

AFV-01

3

ACTIVITY NUMBER	SAMPLE NUMBER (a)	SAMPLE INTERVAL		PERCENT FINER BY WEIGHT										
				STANDARD SIEVE OPENING							U S STANDARD SIEVE			
				BLDRS.	COBBLES		GRAVEL				SAND			
		FEET	METERS	24"	12"	6"	3"	1½"	3/4"	3/8"	4	10	40	10
WA-B-2	P 14	90.0 90.9	27.43 27.71											
	P-14	90.9 91.8	27.71 27.98											
	P 15	101.0 102.0	30.78 31.09											
	P 16	110.9 111.8	33.80 34.08											
	P 17	121.0 122.0	36.88 37.19											10
	P 18	140.0 140.8	42.67 42.92											
	P 19	151.0 152.0	46.02 46.33											
WA-B-3	D 1	0.6 1.0	0.18 0.30						100	95	88	80	58	3
	D 2	3.7 4.4	1.13 1.34						100	90	81	70	54	38
	D 3	6.2 6.7	1.89 2.04						100	75	58	44	26	12
	D 4	10.3 11.0	3.14 3.35											
	D 5	15.0 15.7	4.57 4.79						100	86	66	45	23	13
	D 6	20.3 21.0	6.19 6.40											
	D 7	25.3 25.9	7.71 7.89						100	95	88	81	68	36
	D 8	31.3 32.0	9.54 9.75											
	P 9	39.0 39.8	11.89 12.13						100	98	94	82	62	40
	D 10	50.1 50.8	15.27 15.48											
	D 11	60.3 61.0	18.38 18.59											
	D 12	70.3 71.0	21.43 21.64							100	98	95	89	70
	D 13	80.3 81.0	24.48 24.69											
	D 14	90.3 91.0	27.52 27.74					100	90	69	54	41	30	18
	P 15	98.0 98.6	29.87 30.05											
	P-15	98.6 99.2	30.05 30.24											
	D 16	110.8 111.5	33.77 33.99						100	94	84	76	64	49
	D-17	120.1 120.8	36.61 36.82											
	D 18	140.3 141.0	42.76 42.98											
	D 19	159.2 159.9	48.52 48.74											
WA-B-4	P 1	1.0 2.0	0.30 0.61								100	98	78	4
	P 2	3.9 4.8	1.19 1.46					100	88	83	80	72	41	2
	P 3	7.0 7.9	2.13 2.41											
	D 4	10.2 10.9	3.11 3.32					100	86	68	55	42	21	7
	D 5	15.3 16.0	4.66 4.88											
	D 6	20.0 20.7	6.10 6.31								100	99	91	6
	D 7	25.7 26.4	7.83 8.05						100	99	98	95	68	3
	D 8	30.2 30.9	9.20 9.42											
	P 9	40.0 41.1	12.19 12.53											
	D 10	41.8 42.5	12.74 12.95						100	76	63	48	32	1
	D 11	50.2 50.9	15.30 15.51											
	D 12	60.3 61.0	18.38 18.59											
	D 13	70.3 71.0	21.43 21.64						100	99	95	81	43	1
	D 14	80.8 81.5	24.63 24.84							100	92	78	57	4

NOTES:

(a) Sample types
- SS - Standard split spoon
- P - Pitcher
- D - Fugro Drive
- B,b - Bulk

(b) NP - Not Plastic

(c) USCS - Unified Soil Classification System

(d) * Indicates that test has been performed and results are included in this report

R BY WEIGHT							ATTERBERG LIMITS (b)			USCS (c)	IN-SITU					COMPACTED			SPECIFIC GRAVITY OF SOLIDS
U S STANDARD SIEVE NO.					PARTICLE SIZE (mm)						DRY UNIT WEIGHT		MOISTURE CONTENT (%)	SATURATION (%)	VOID RATIO	MAXIMUM DRY DENSITY		OPTIMUM MOISTURE (%)	
SAND				SILT OR CLAY															
4	10	40	100	200	.005	.001	LL	PL	PI		(pcf)	(kg/m³)				(pcf)	(kg/m³)		
										CH	103.2	1653	24.0	100.0	0.63				
				100			56	22	34	CH	103.0	1650	23.4	99.5	0.64				
										CH	93.3	1495	29.4	98.6	0.81				
										CH	101.1	1620	24.5	99.2	0.67				
			100	99			60	23	37	CH	102.0	1634	24.0	99.2	0.65				
										CH	106.8	1711	23.5	100.0	0.58				
										CH	103.3	1655	23.9	100.0	0.63				
88	80	58	37	26						SM			2.8						
81	70	54	38	28						SM	104.5	1674	5.9	26.3	0.61				
58	44	26	12	8						SP SM	111.1	1780	4.8	25.1	0.52				
										GP GM	126.5	2027	4.6	37.5	0.33				
66	45	23	13	10						SW SM	114.2	1829	9.1	51.9	0.48				
										SW SM	114.4	1833	9.4	53.7	0.47				
88	81	68	36	31						SM	120.1	1924	9.9	66.1	0.40				
										SW SM	115.7	1854	5.8	34.5	0.46				
94	82	62	40	25						SM	100.8	1615	13.7	55.2	0.67				
										GP GM	124.2	1990	6.3	47.6	0.36				
										SW SM	114.9	1841	11.5	66.6	0.47				
98	95	89	70	54						ML	107.9	1729	11.1	53.3	0.56				
										ML	109.9	1761	8.9	45.1	0.53				
54	41	30	18	12						GP-GM	122.5	1962	3.4	24.1	0.38				
										ML	84.8	1358	25.1	68.8	0.99				
										SM	101.2	1621	9.5	38.7	0.67				
84	76	64	49	37						SM	111.6	1788	12.3	65.3	0.51				
										GP-GM	128.6	2060	7.5	65.6	0.31				
										ML	109.9	1761	10.9	55.1	0.53				
										GP-GM	126.7	2030	9.0	73.7	0.33				
100	98	78	45	36						SM	95.9	1536	5.3	18.9	0.76				
80	72	41	27	19			23	18	5	SM-SC			8.7						
										SM	81.4	1304	13.1	33.1	1.07				
55	42	21	7	4						SP	120.7	1934	7.4	50.7	0.40				
										SP	123.8	1983	8.7	65.1	0.36				
100	99	91	69	56						ML	98.7	1581	13.4	51.3	0.71				
98	95	68	38	24					NP	SM	113.3	1815	9.3	51.2	0.49				2.71
										SW SM	118.6	1900	7.5	48.1	0.42				
										SM	93.6	1499	28.4	95.8	0.80				
63	48	32	19	15						SM	109.7	1757	13.6	68.4	0.54				
										SM	114.2	1829	4.9	28.2	0.48				
										SM	111.9	1783	12.3	65.6	0.51				
95	81	43	15	10						SW-SM	108.9	1745	10.5	51.7	0.55				
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]						SM	106.6	1708	5.9	27.5	0.58				

COMPACTED									
AXIMUM DENSITY		OPTIMUM MOISTURE (%)	SPECIFIC GRAVITY OF SOLIDS	TRIAXIAL (d)	UNCONFINED COMPRESSION	DIRECT SHEAR	CONSOLIDATION	CHEMICAL	CBR
)	(kg/m³)								
					*				
						*			
						*			
						*			
			2.71			*			
						*			

SUMMARY OF LABORATORY TEST RESULTS
WAH WAH VALLEY, UTAH

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - BMO

TABLE II-8-1
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FUGRO NATIONAL, INC.

AFV-01

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	D 19	140.1-140.8	42.70-42.92											
	D 20	159.3-160.0	48.55-48.77											
WA B 5	D 1	0.0-1.1	00.0-0.34					100	92	83	76	68	53	3
	D 3	6.0-6.8	1.83-2.07						100	95	80	59	35	2
	D-4	10.0-11.0	3.05-3.35											
	D-5	15.3-16.0	4.66-4.88					100	82	54	41	32	18	1
	D-6	20.3-21.0	6.19-6.40											
	D-7	20.1-30.8	9.17-9.39											
	D 8	38.0-39.0	11.58-11.89					100	84	62	36	14	2	1
WA B 6	D 1	1.3-2.5	0.40-0.76								100	85	69	2
	D 5	16.5-17.5	5.03-5.33								100	97	86	3
	D-6	19.0-19.7	5.79-6.00							100	97	91	75	3
	D-7	25.2-25.7	7.68-7.83						100	99	94	84	56	3
WA B 7	D-1	1.5-2.0	0.46-0.61										100	9
	D 2	4.0-4.6	1.22-1.40											
	D-3	5.5-6.0	1.68-1.83											
	D-4	8.6-9.1	2.62-2.77						100	97	97	97	27	3
	D 5	10.5-11.0	3.20-3.35											
	P 6	15.0-15.4	4.57-4.69										100	9
	P 7	20.8-21.3	6.34-6.49											
	P 8	25.8-26.8	7.86-8.17											
	P 9	30.2-30.7	9.20-9.36											
	P-9	30.9-31.4	9.42-9.57											
	P-9	31.5-32.0	9.60-9.75											
	P-9	31.5-32.0	9.60-9.75											1
	P 10	35.8-36.6	10.91-11.16											
	P 12	55.8-56.6	17.00-17.25											
	P 13	65.8-66.6	20.06-20.30											
	P 14	75.8-76.6	23.10-23.35											
	P 15	85.8-86.6	26.15-26.40											
	P 16	100.8-101.6	30.72-30.97											
	P 17	110.8-111.4	33.77-33.95											

		GW-GM	118.6
		GP GM	128.4
		GW	
		SM	93.1
		SM	100.4
	NP	SM	106.5
		SM	104.9
43	14	MH	55.6
		CH	95.5
		SP	121.6
		SP	106.4
		CL	109.1
19	34	CH	97.9
		CH	97.1
		CH	98.7
		CH	99.1
		CH	99.7
		CH	98.9
18	39	CH	98.6
		CH	95.0
		CH	98.3

...PACTED		SPECIFIC GRAVITY OF SOLIDS	TRIAXIAL (d)	UNCONFINED COMPRESSION	DIRECT SHEAR	CONSOLIDATION	CHEMICAL	CBR
...M ...ITY (kg/m³)	OPTIMUM MOISTURE (%)							
							*	
					*			
			*					
			*					
			*					

SUMMARY OF LABORATORY TEST RESULTS
WAH WAH VALLEY, UTAH

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - BMO

TABLE II-8-1
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0.5 - 2.0	0.15 - 0.61			
5.0 - 6.0	1.52 - 1.83			
0.5 - 2.0	0.15 - 0.61			
5.0 - 6.0	1.52 - 1.83			
10.0 - 11.0	3.05 - 3.35			
0.5 - 2.0	0.15 - 0.61			
5.0 - 6.0	1.52 - 1.83			
0.5 - 2.0	0.15 - 0.61			
0.5 - 2.0	0.15 - 0.61			
7.0 - 8.0	2.13 - 2.44			
0.5 - 2.0	0.15 - 0.61			
8.0 - 9.0	2.44 - 2.74			
7.0 - 8.0	2.13 - 2.44			
0.5 - 2.0	0.15 - 0.61			
0.5 - 1.5	0.15 - 0.46			
2.0 - 3.0	0.61 - 0.91			
0.5 - 2.0	0.15 - 0.61			
0.5 - 2.0	0.15 - 0.61			

	...ER BY WEIGHT											IN-SITU					COMPACTED			
	U S STANDARD SIEVE NO.					PARTICLE SIZE (mm)	ATTERBERG LIMITS (b)			USCS (c)	DRY UNIT WEIGHT		MOISTURE CONTENT (%)	SATURATION (%)	VOID RATIO	MAXIMUM DRY DENSITY		OPTIMUM MOISTURE (%)	SPECIFIC GRAVITY OF SOLIDS
	SAND				SILT OR CLAY														
	4	10	40	100	200	.005	.001	LL	PL	PI		(pcf)	(kg/m³)				(pcf)	(kg/m³)		
											CH	104.4	1672	22.2	97.9	0.61				
											CL	117.5	1882	20.1	100.0	0.43				
			100	83	67						CI	107.9	1728	21.1	100.0	0.56				
	85	75	55	24	17						SM						127.8	2047	9.7	
	44	37	29	23	20						GM									
	36	27	16	10	7						GP GM									
	100	98	85	66	52			25	21	4	CL ML						121.4	1945	12.7	2.69
		100	99	97	95			44	37	7	ML									
	97	88	46	23	14						SM									
	100	98	86	69	59			33	18	15	CL						116.4	1865	14.9	
	99	93	55	26	17						SM									
	73	65	46	34	28						SM									
	94	88	60	39	33			35	25	10	SM									
	61	41	10	4	4						SW									
	94	87	72	62	51			23	20	3	ML									
	78	59	25	15	12						SP-SM									
	60	34	13	7	5						SW SM									
	61	46	22	11	8						SW SM						131.0	2099	9.1	
	78	76	60	44	40			29	18	11	SC						124.5	1994	11.4	2.66
	56	51	33	14	11						SP-SM									
	45	37	29	21	17						GM						133.5	2139	8.8	
	64	22	7	5	3						SP						133.6	2140	8.5	
	23	22	20	17	15						GM									
	42	27	13	8	6						GW-GM									
		100	98	92	86					NP	ML						109.5	1754	17.4	2.64
	100	99	95	72	53						ML									
	85	75	62	37	27						SM						118.5	1898	14.0	
					100			67	24	43	CH									

1 2

COMPACTED									
AXIMUM DENSITY		OPTIMUM MOISTURE (%)	SPECIFIC GRAVITY OF SOLIDS	TRIAXIAL (d)	UNCONFINED COMPRESSION	DIRECT SHEAR	CONSOLIDATION	CHEMICAL	CBR
)	(kg/m³)								
.8	2047	9.7							*
.4	1945	12.7	2.69					*	*
6.4	1865	14.9							*
								*	
0	2099	9.1						*	*
4.5	1994	11.4	2.66						*
3.5	2139	8.8							*
3.6	2140	8.5							*
								*	
9.5	1754	17.4	2.64						*
8.5	1898	14.0							*

SUMMARY OF LABORATORY TEST RESULTS
WAH WAH VALLEY, UTAH

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - BMO

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FUGRO NATIONAL, INC.

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ACTIVITY NUMBER	SAMPLE NUMBER (a)	SAMPLE INTERVAL		PERCENT FINER BY WEIGHT										
				STANDARD SIEVE OPENING							U S STANDARD SIEVE			
				BLDRS.	COBBLES		GRAVEL				SAND			
		FEET	METERS	24"	12"	6"	3"	1½"	3/4"	3/8"	4	10	40	100
WA-T-17	B 1	0.5 2.0	0.15 0.61					100	90	70	55	44	36	29
WA-T 18	B 1	0.5 2.0	0.15 0.61					100	91	66	54	45	35	20
	b 2	7.0 8.0	2.13 2.44						100	96	91	86	80	66
WA-T-19	B 1	0.5 2.0	0.15 0.61									100	98	94
	b 2	3.0 4.0	0.91 1.22									100	99	99
WA-T-20	b 2	2.0 3.0	0.61 0.91					100	90	78	70	62	10	4
	B 4	7.0 8.0	2.13 2.44				100	91	72	58	51	46	37	34
	b 5	10.0 11.0	3.05 3.35										100	99
WA-P 2	B 1	0.5 2.0	0.15 0.61					100	91	70	57	46	31	22
WA-P 3	B 2	3.0 4.0	0.91 1.22					100	88	62	35	12	3	2
WA-P 4	B 1	0.5 2.0	0.15 0.61						100	98	92	82	55	32
WA-P 5	b 1	0.5 2.0	0.15 0.61						100	87	73	59	34	19
WA-P-6	b 1	0.5 2.0	0.15 0.61						100	98	93	83	48	23
WA-P 7	b 1	0.5 2.0	0.15 0.61						100	99	98	94	80	63
	b 2	3.0 4.0	0.91 1.22						100	96	81	55	20	8
WA-P 8	B 1	0.5 2.0	0.15 0.61							100	97	89	76	42
WA-P 9	b-1	0.5 2.0	0.15 0.61						100	95	89	83	69	44
WA-P 11	B 1	0.5 2.0	0.15 0.61					100	95	76	62	51	40	30
WA-P 12	B 1	0.5 2.0	0.15 0.61						100	91	84	77	69	56
	b 2	4.0 5.0	1.22 1.52					100	86	63	44	30	19	12
WA-P 14	b 1	0.5 2.0	0.15 0.61						100	91	76	65	57	44
WA-P 15	b 1	0.5 2.0	0.15 0.61						100	91	74	64	45	22
	b 2	3.0 4.0	0.91 1.22					100	97	92	82	55	17	5
WA-P 16	B 1	0.5 2.0	0.15 0.61										100	97
WA-P 17	b 1	0.5 1.5	0.15 0.46							100	98	96	83	39

NOTES:

(a) Sample types
- SS – Standard split spoon
- P – Pitcher
- D – Fugro Drive
- B,b – Bulk

(b) NP – Not Plastic

(c) USCS – Unified Soil Classification System

(d) * Indicates that test has been performed and results are included in this report

INER BY WEIGHT												IN-SITU						COMPACTED			
	U S STANDARD SIEVE NO.					PARTICLE SIZE (mm)		ATTERBERG LIMITS (b)			USCS (c)	DRY UNIT WEIGHT		MOISTURE CONTENT (%)	SATURATION (%)	VOID RATIO	MAXIMUM DRY DENSITY		OPTIMUM MOISTURE (%)	SPECIFIC GRAVITY OF SOLIDS
	SAND				SILT OR CLAY																
"	4	10	40	100	200	.005	.001	LL	PL	PI		(pcf)	(kg/m³)				(pcf)	(kg/m³)		
0	55	44	36	29	25						GM									
6	54	45	35	20	17						GM									
6	91	86	80	66	55			21	18	3	ML									
		100	98	94	89			46	34	12	ML									
		100	99	99	99						CL									
8	70	62	10	4	4						SP									
8	51	46	37	34	33			49	30	19	GC									
			100	99	99	85	57				CL									
0	57	46	31	22	18						GM									
2	35	12	3	2	2						GW									
8	92	82	55	32	25						SM						125.7	2014	11.0	
7	73	59	34	19	13						SM									
8	93	83	48	23	17						SM									
9	98	94	80	63	50						ML									
6	81	55	20	8	7						SW-SM									
00	97	89	76	42	19						SM									
5	89	83	69	44	33						SM									
6	62	51	40	30	27						GM									
1	84	77	69	56	40					NP	SM									
3	44	30	19	12	7						GP-GM									
1	76	65	57	44	34						SM									
1	74	64	45	22	20						SM									
2	82	55	17	5	3						SW									
			100	97	90			28	22	6	CL-ML						114.6	1836	15.7	
00	98	96	83	39	22					NP	SM									

1 2

…TED								
…³)	OPTIMUM MOISTURE (%)	SPECIFIC GRAVITY OF SOLIDS	TRIAXIAL (d)	UNCONFINED COMPRESSION	DIRECT SHEAR	CONSOLIDATION	CHEMICAL	CBR
							*	
…014	11.0							*
…1836	15.7							*
							*	

SUMMARY OF LABORATORY TEST RESULTS
WAH WAH VALLEY, UTAH

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - BMO

TABLE
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FUGRO NATIONAL, INC.

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0.5 2.0	0.15 0.61							100	99	95	46
0.5 2.0	0.15 0.61						100	91	86	79	67
2.0 3.0	0.61 0.91					100	99	67	39	28	20
0.5 2.0	0.15 0.61						100	96	92	79	50
0.5 2.0	0.15 0.61						100	98	93	85	59
0.5 2.0	0.15 0.61						100	88	80	72	49
0.5 2.0	0.15 0.61					100	90	72	63	54	40
2.5 3.0	0.76 0.91					100	95	75	56	35	12
0.5 2.0	0.15 0.61					100	85	62	40	29	20
0.5 2.0	0.15 0.61					100	96	84	76	69	57
0.5 2.0	0.15 0.61						100	98	[illegible]	95	78
0.5 2.0	0.15 0.61										
0.5 2.0	0.15 0.61								100	98	35
0.5 2.0	0.15 0.61					100	87	57	45	37	30
0.5 2.0	0.15 0.61						100	99	96	91	74
0.5 1.0	0.15 0.61								100	95	42
1.5 2.0	0.46 0.61										
0.5 1.0	0.15 0.30								100	89	66
1.0 1.5	0.30 0.46							100	99	96	80
2.0 2.5	0.61 0.76							100	99	95	73
3.0 3.5	0.91 1.07								100	98	75
4.0 4.5	1.22 1.37						100	98	96	93	76
1.0 1.5	0.30 0.46							100	95	88	66

			SP-SM				
			SM				
		NP	SM				
			SM				
			GP-GM				
28	16	12	SC				
			SM				
			SM				
			SM				
			SM				
			GM				
			SM				
			SM				
34	28	6	ML				
			SM				
			GM				

RATIO	COMPACTED MAXIMUM DRY DENSITY (pcf)	COMPACTED MAXIMUM DRY DENSITY (kg/m^3)	COMPACTED OPTIMUM MOISTURE (%)	SPECIFIC GRAVITY OF SOLIDS	TRIAXIAL (d)	UNCONFINED COMPRESSION	DIRECT SHEAR	CONSOLIDATION	CHEMICAL	CBR
	124.9	2001	10.6	2.69						*
									*	

SUMMARY OF LABORATORY TEST RESULTS
WAH WAH VALLEY, UTAH

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - BMO

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FUGRO NATIONAL, INC.

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ACTIVITY NUMBER	SAMPLE NUMBER (a)	SAMPLE INTERVAL		PERCENT FINER BY WEIGHT										
				STANDARD SIEVE OPENING							U S STANDARD SIEVE			
				BLDRS.	COBBLES		GRAVEL				SAND			
		FEET	METERS	24"	12"	6"	3"	1½"	3/4"	3/8"	4	10	40	100
WA-F-2	B-2	2.0 2.5	0.61 0.76							100	96	89	49	19
	b 3	3.0 3.5	0.91 1.07						100	89	63	38	16	7
WA F-3	b 1	1.0 1.5	0.30 0.46						100	94	85	75	47	27
	b 2	2.0 2.5	0.61 0.76						100	94	88	80	53	32
	B 3	3.0 3.5	0.91 1.07						100	92	84	73	45	25
	b 4	4.0 4.5	1.22 1.37						100	94	88	79	46	20
WA F 4	b 1	1.0 1.5	0.30 0.46							100	99	98	77	47
	b 2	2.0 2.5	0.61 0.76											
	b 3	3.0 3.5	0.91 1.07								100	95	81	73
	b 4	4.0 4.5	1.22 1.37											
WA F 5	b 1	1.0 1.5	0.30 0.46										100	96
	b 2	2.0 2.5	0.61 0.76									100	99	96
	b 3	3.0 3.5	0.91 1.07								100	98	93	77
	b 4	4.0 4.5	1.22 1.37											
WA F 6	b 1	1.0 1.5	0.30 0.46							100	96	90	76	38
	b 2	2.0 2.5	0.61 0.76						100	86	83	77	65	30
WA F 7	b 1	1.0 1.5	0.30 0.46									100	98	92
	b 2	2.0 2.5	0.61 0.76											
	B-3	3.0 3.5	0.91 1.07									100	99	97
	b 4	4.0 4.5	1.22 1.37									100	99	98
WA F-8	B 1	1.0 1.5	0.30 0.46						100	99	91	84	69	45
	b 2	2.0 2.5	0.61 0.76							100	90	81	63	36

NOTES:

(a) Sample types
- SS - Standard split spoon
- P - Pitcher
- D - Fugro Drive
- B,b - Bulk

(b) NP - Not Plastic

(c) USCS - Unified Soil Classification System

(d) * Indicates that test has been performed and results are included in this report

CHECKED BY ______ APPROVED BY ______

T FINER BY WEIGHT								ATTERBERG LIMITS (b)			USCS (c)	IN-SITU					COMPACTED			SPECIFIC GRAVITY OF SOLIDS
	U S STANDARD SIEVE NO.					PARTICLE SIZE (mm)						DRY UNIT WEIGHT		MOISTURE CONTENT (%)	SATURATION (%)	VOID RATIO	MAXIMUM DRY DENSITY		OPTIMUM MOISTURE (%)	
	SAND				SILT OR CLAY															
3/8"	4	10	40	100	200	.005	.001	LL	PL	PI		(pcf)	(kg/m³)				(pcf)	(kg/m³)		
100	96	89	49	19	13						SM			5.0			121 8	1951	12 0	
89	63	38	16	7	6						SW SM			3.2						
94	85	75	47	27	20						SM			5.6						
94	88	80	53	32	24						SM			5.5						
92	84	73	45	25	18						SM			4.6			125.8	2015	10.5	
94	88	79	46	20	15						SM			4 9						
100	99	98	77	47	35			25	18	7	SM-SC			5.4						
											SM-SC			7.6						
	100	95	81	73	71			43	25	18	CL			10.9						
											CL			4.6						
			100	96	84			25	18	7	CL ML			8.7						
		100	99	96	87			25	20	5	CL ML			7.9						
	100	98	93	77	65			26	18	8	CL			9.3						
											CL			11.5						
100	96	90	76	38	23						SM			4.5						
86	83	77	65	30	18						SM			4.4						
		100	98	92	86			35	27	8	ML			11.3						
											ML			11.5						
		100	99	97	95			47	38	9	ML			14.6			102.3	1639	22 0	
		100	99	98	97			49	35	14	ML			12.5						
99	91	84	69	45	29						SM			4.5			126.7	2030	10 0	
100	90	81	63	36	24						SM			7 7						

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VOID RATIO	COMPACTED MAXIMUM DRY DENSITY (pcf)	COMPACTED MAXIMUM DRY DENSITY (kg/m³)	COMPACTED OPTIMUM MOISTURE (%)	SPECIFIC GRAVITY OF SOLIDS	TRIAXIAL (d)	UNCONFINED COMPRESSION	DIRECT SHEAR	CONSOLIDATION	CHEMICAL	CBR
	121.8	1951	12.0							*
	125.8	2015	10.5							*
	102.3	1639	22.0							*
	126.7	2030	10.0							*

SUMMARY OF LABORATORY TEST RESULTS
WAH WAH VALLEY, UTAH

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - BMO

TABLE II-8-1

FUGRO NATIONAL, INC.

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CHECKED BY____ ____ ____ APPROVED BY____ ____ ____

BORING NO.	SAMPLE NO.	SAMPLE INTERVAL FEET	SAMPLE INTERVAL METERS	SOIL TYPE	TYPE OF TEST	DRY DENSITY pcf	DRY DENSITY kg/m³	MOISTURE CONTENT (%)	CONFINING PRESSURE (σ_3) ksf	CONFINING PRESSURE (σ_3) kN/m²	MAXIMUM DEVIATOR STRESS ($\sigma_1-\sigma_3$) ksf	MAXIMUM DEVIATOR STRESS ($\sigma_1-\sigma_3$) kN/m²	STRAIN RATE (%/min)	BACK PRESSURE ksf	BACK PRESSURE kN/m²
WA-B-1	P-7	25.0 - 25.9	7.62 - 7.89	CH	CD	103.7	1661	22.0	2.5	120	26.9	1288	0.05	0	0
	P-7	25.9 - 26.8	7.89 - 8.17	CH	CD	105.6	1692	18.6	3.3	158	28.6	1369	0.05	0	0
	P-7	26.8 - 27.5	8.17 - 8.38	CH	CD	109.7	1757	18.6	5.0	239	37.5	1796	0.05	0	0
	P-13	80.5 - 81.3	24.54 - 24.78	SC	CD	109.4	1753	13.8	8.0	383	20.4	977	0.02	0	0
	P-13	82.1 - 82.9	25.02 - 25.27	SC	CD	111.6	1788	15.7	10.0	479	26.4	1264	0.02	0	0
	P-13	81.3 - 82.1	24.78 - 25.02	SC	CD	110.2	1765	13.4	12.7	608	30.7	1470	0.02	0	0
WA-B-2	P-12	71.8 - 72.3	21.88 - 22.04	CH	CD	92.5	1482	31.6	7.0	335	14.6	699	0.02	0	0
	P-12	70.0 - 70.5	21.34 - 21.49	CH	CD	89.6	1435	32.9	9.5	455	15.9	761	0.02	0	0
	P-12	70.9 - 71.4	21.61 - 21.76	CH	CD	92.9	1488	30.8	12.0	575	17.2	824	0.02	0	0
WA-B-7	P-9	30.9 - 31.4	9.42 - 9.57	CH	CD	99.7	1597	26.5	3.0	144	9.7	464	0.04	0	0
	P-9	30.2 - 30.7	9.20 - 9.36	CH	CD	99.1	1587	26.1	6.0	287	14.3	685	0.04	0	0
	P-9	31.5 - 32.0	9.60 - 9.75	CH	CD	98.9	1583	26.7	9.0	431	17.2	824	0.04	0	0

SUMMARY OF TRIAXIAL COMPRESSION TEST RESULTS
WAH WAH VALLEY, UTAH

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - BMO

TABLE II-8-2

FUGRO NATIONAL, INC.

BORING NO.	SAMPLE NO.	SAMPLE INTERVAL FEET	SAMPLE INTERVAL METERS	SOIL TYPE	UNCONFINED COMP. STRENGTH ksf	UNCONFINED COMP. STRENGTH kN/m^2	DRY DENSITY pcf	DRY DENSITY kg/m^3	MOISTURE CONTENT (%)	DEGREE OF SATURATION (%)	HEIGHT/ DIAMETER
WA-B-2	P-2	3.0 - 3.5	0.91 - 1.07	MH	1.4	67	103.2	1653	24.0	100.0	2.40
	P-14	90.0 - 90.9	27.43 - 27.71	CH	21.0	1005	103.2	1653	24.0	100.0	2.09

SUMMARY OF UNCONFINED COMPRESSION TEST RESULTS
WAH WAH VALLEY, UTAH

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - BMO

TABLE II-8-3

FUGRO NATIONAL, INC.

CHECKED BY ____ / / APPROVED BY ____ / /

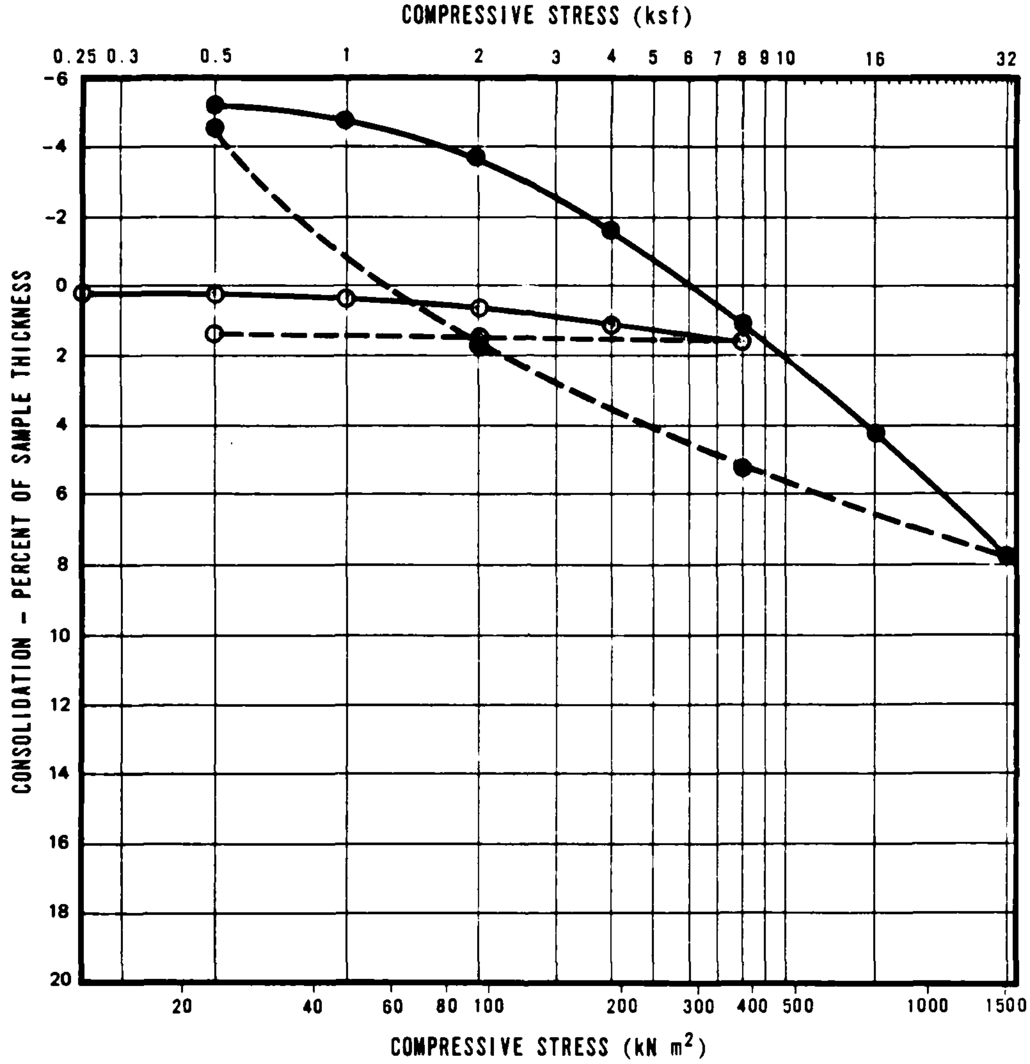
BORING NO.	SAMPLE NO.	SAMPLE INTERVAL		SOIL TYPE	NORMAL STRESS		MAXIMUM SHEAR STRENGTH	
		FEET	METERS		ksf	kN/m²	ksf	kN/m²
WA-B-1	P-4	10.9 - 11.7	3.32 - 3.57	CH	1.0	48	1.32	63
					1.5	72	1.40	67
					2.0	96	1.69	81
WA-B-3	D-2	3.7 - 4.4	1.13 - 1.34	SM	0.4	19	0.93	45
					0.6	29	0.98	47
WA-B-3	D-12	70.3 - 71.0	21.43 - 21.64	ML	7.0	335	8.82	422
					9.5	455	10 51	503
WA-B-4	D-4	10.2 - 10.9	3.11 - 3.32	SP	1.0	48	1.06	51
					1.5	72	2.44	117
					2.0	96	2.27	109
WA-B-4	D-7	25.7 - 26.4	7.83 - 8.05	SM	3.8	182	3.67	176
					5.0	239	5.39	258
WA-B-4	D-14	80.8 - 81.5	24.63 - 24.84	SM	8.0	383	8.00	383
					10.0	479	9.40	450
WA-B-6	D-6	19.0 - 19.7	5.79 - 6.00	SM	2.0	96	3.50	168
					4.0	192	4.97	238
					8.0	383	9.41	451

DIRECT SHEAR TEST RESULTS
WAH WAH VALLEY, UTAH

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - BMO

TABLE II-8-4

FUGRO NATIONAL, INC.



SYMBOL	BORING NO.	SAMPLE NO.	SAMPLE INTERVAL		SOIL TYPE	INITIAL DRY DENSITY		INITIAL MOISTURE CONTENT (%)	INITIAL VOID RATIO	INITIAL DEGREE OF SATURATION (%)
			FEET	METERS		pcf	kg m3			
O	WA-B-2	D-8	30.7 - 31.4	9.36 - 9.57	CH	92.3	1479	31.9	0.83	104.4

O AT FIELD MOISTURE

● AFTER ADDITION OF WATER

——— COMPRESSION

— — — REBOUND

CONSOLIDATION TEST RESULTS
WAH WAH VALLEY, UTAH

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE BMO

FIGURE II-8-1

FUGRO NATIONAL, INC.

APPROVED BY ______

CHECKED BY ______

FN-TR-27-WA-II

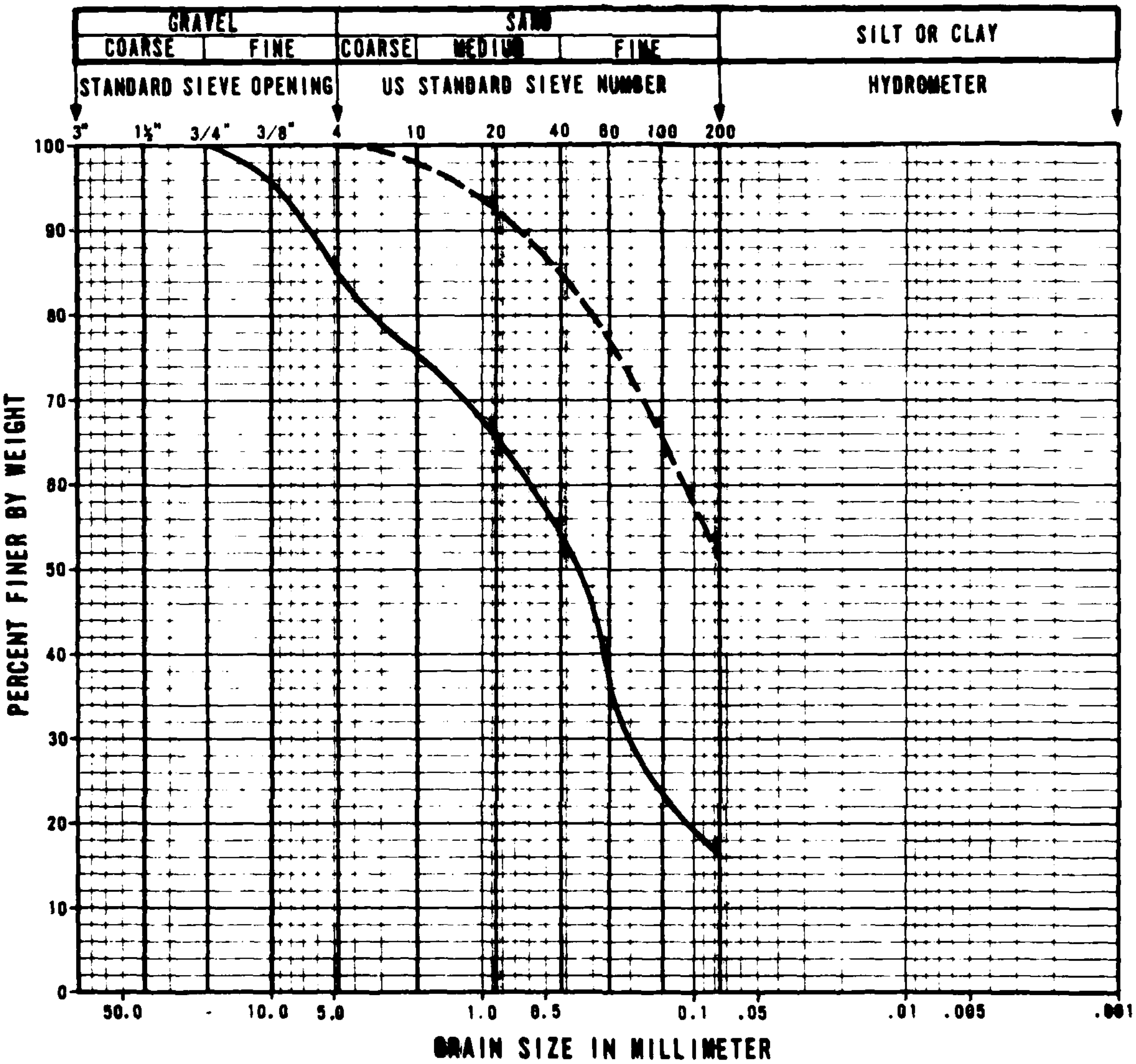
ACTIVITY NO.	SAMPLE NO.	SAMPLE INTERVAL		SOIL TYPE	pH	WATER SOLUBLE				CALCIUM CARBONATE
		FEET	METERS			SODIUM mg/kg	CHLORIDE mg/kg	SULPHATE mg/kg	CALCIUM mg/kg	mg/kg
WA-B-1	D-3	6.7 - 7.4	2.04 - 2.26	SM	9.9	490	26	194	48	120
WA-B-2	P-1Y	60.0 - 61.7	18.29 - 18.81	CH	9.0	3130	24	1670	120	600
WA-B-4	D-15	90.1 - 90.8	27.46 - 27.68	SW-SM	8.7	27	550	32	175	650
WA-T-3	B-1	0.5 - 2.0	0.15 - 0.61	CL-ML	8.8	625	625	41	87	365
WA-T-5	B-1	0.5 - 2.0	0.15 - 0.61	SM	9.3	270	87	75	172	495
WA-T-10	B-1	0.5 - 2.0	0.15 - 0.61	SW-SM	8.8	164	68	132	90	285
WA-T-14	B-1	0.5 - 2.0	0.15 - 0.61	GM	8.7	71	22	44	76	370
WA-T-17	B-1	0.5 - 2.0	0.15 - 0.61	GM	8.3	913	1130	733	106	690
WA-P-17	b-1	0.5 - 1.5	0.15 - 0.46	SM	9.1	92	202	4	49	295
WA-CS-47	b-1	0.5 - 2.0	0.15 - 0.61	ML	7.9	3150	4280	2270	69	2055

SUMMARY OF CHEMICAL TEST RESULTS
WAH WAH VALLEY, UTAH

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE BMO

TABLE
II-8.5

FUGRO NATIONAL, INC.



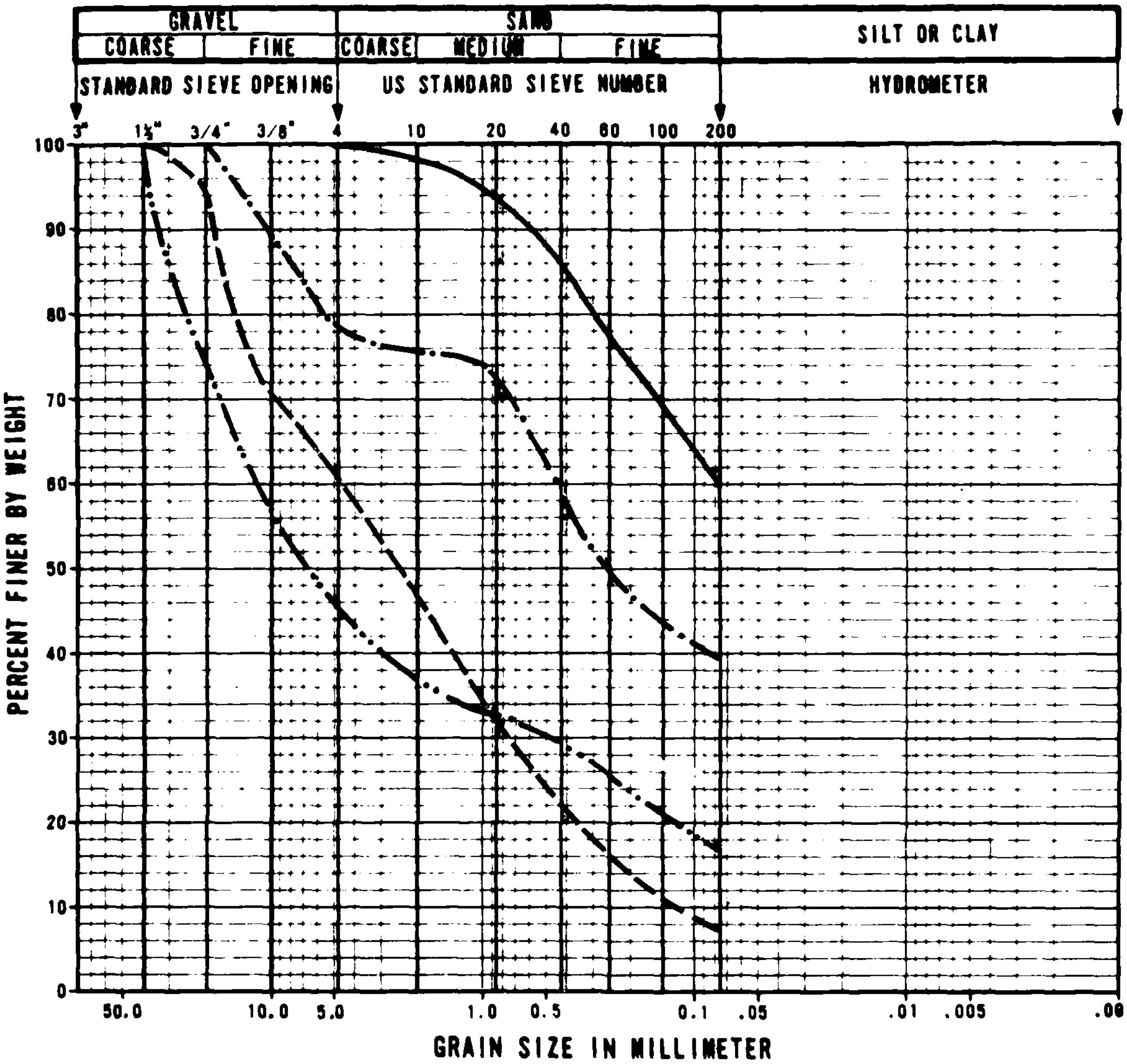
SYMBOL	COMPOSITE SAMPLE NUMBER	ACTIVITY NUMBER	SAMPLE INTERVAL FEET	SAMPLE INTERVAL METERS	SOIL TYPE
———	A	WA-T-1	0.5 2.0	0.15 - 0.61	SM
— —	B	WA-T-3	0.5 - 2.0	0.15 - 0.61	CL-ML

GRAIN SIZE CURVES, CBR TESTS
WAH WAH VALLEY, UTAH

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - BMO

FIGURE
II-8-2
1 OF 5

FUGRO NATIONAL, INC.



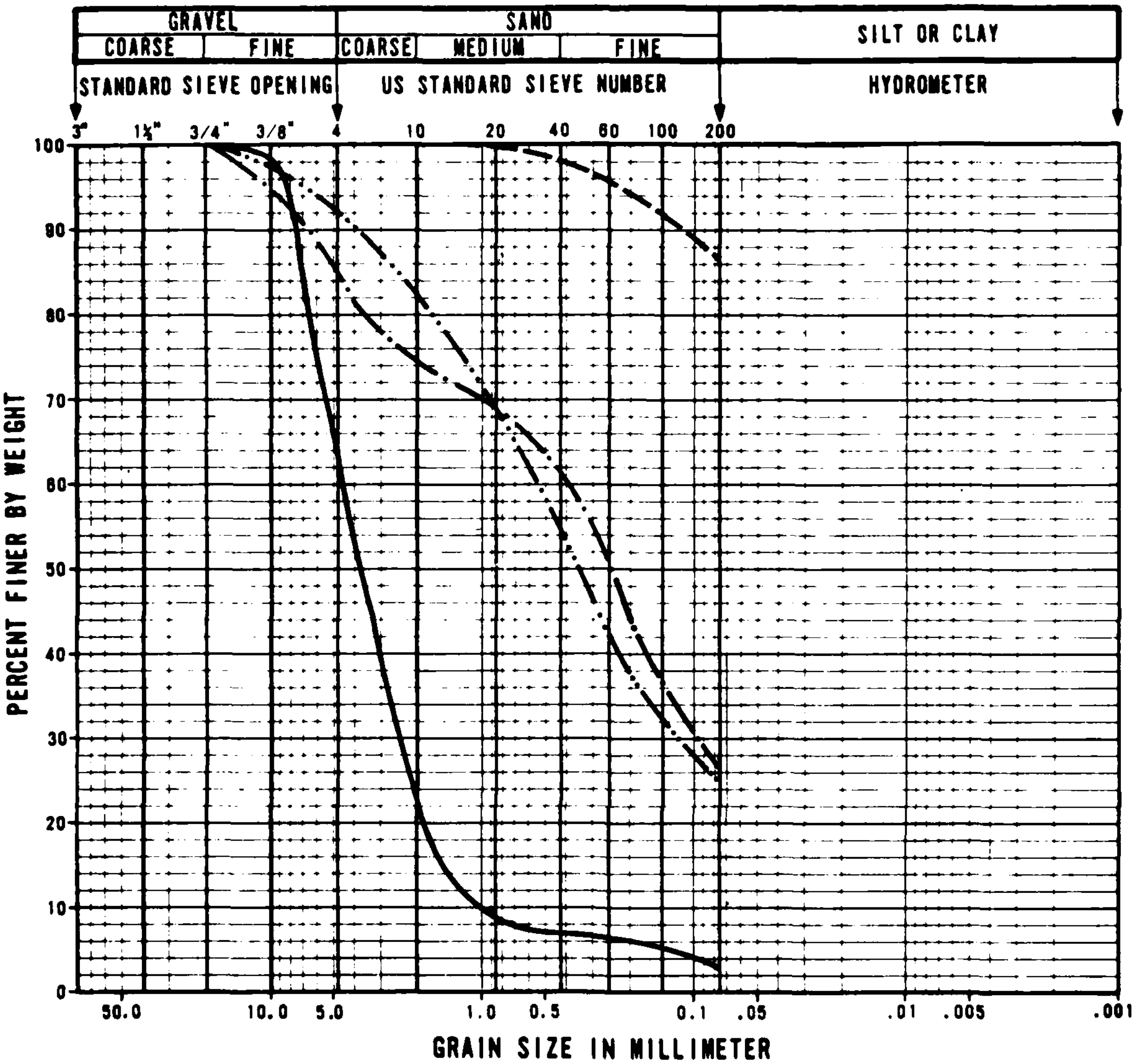
SYMBOL	COMPOSITE SAMPLE NUMBER	ACTIVITY NUMBER	SAMPLE INTERVAL		SOIL TYPE
			FEET	METERS	
———	C	WA-T-4	0.5 - 2.0	0.15 - 0.61	CL
— —	D	WA-T-10	0.5 - 2.0	0.15 - 0.61	SW-SM
—·—	E	WA-T-11	0.5 - 1.5	0.15 - 0.46	SC
—··—	F	WA-T-12	0.5 - 2.0	0.15 - 0.61	GM

GRAIN SIZE CURVES, CBR TESTS
WAH WAH VALLEY, UTAH

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE BMO

FIGURE
II-8-2
2 OF 5

FUGRO NATIONAL, INC.



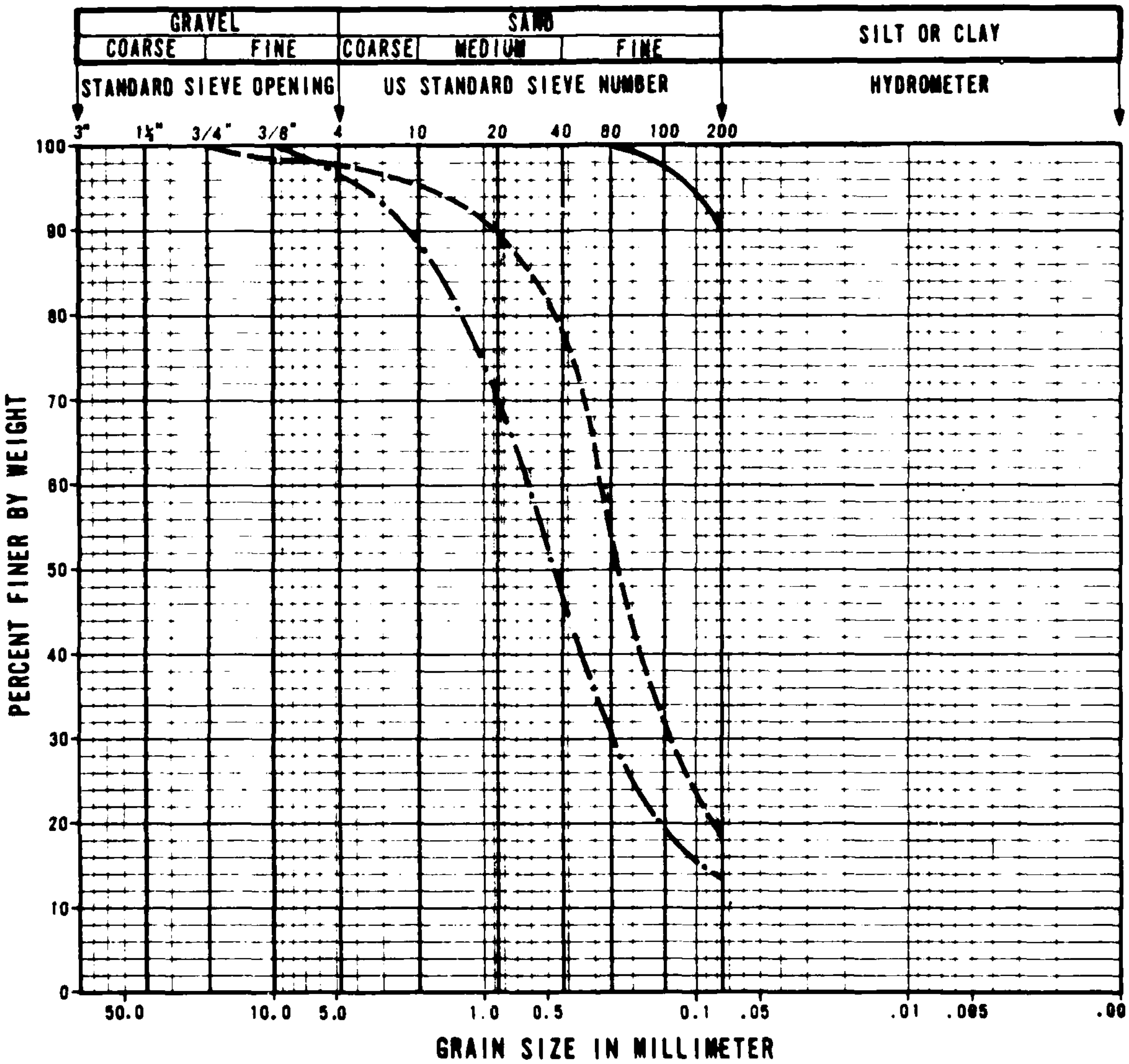
SYMBOL	COMPOSITE SAMPLE NUMBER	ACTIVITY NUMBER	SAMPLE INTERVAL FEET	SAMPLE INTERVAL METERS	SOIL TYPE
———	G	WA-T-13	0.5 - 2.0	0.15 - 0.61	SP
———	H	WA-T-15	0.5 - 2.0	0.15 - 0.61	ML
—·—	I	WA-T-16	0.5 - 2.0	0.15 - 0.61	SM
—··—	J	WA-P-4	0.5 - 2.0	0.15 - 0.61	SM

GRAIN SIZE CURVES, CBR TESTS
WAH WAH VALLEY, UTAH

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - BMO

FIGURE
II-8-2
3 OF 5

FUGRO NATIONAL, INC.



SYMBOL	COMPOSITE SAMPLE NUMBER	ACTIVITY NUMBER	SAMPLE INTERVAL FEET	SAMPLE INTERVAL METERS	SOIL TYPE
——	K	WA-P-13	0.5 - 2.0	0.15 - 0.61	CL-ML
— —	L	WA-CS-43	0.5 - 2.0	0.15 - 0.61	SM
—·—	M	WA-F-2	2.0 - 2.5	0.61 - 0.76	SM

GRAIN SIZE CURVES, CBR TESTS
WAH WAH VALLEY, UTAH

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - BMO

FIGURE II-8-2
4 OF 5

FUGRO NATIONAL, INC.

AD-A113 393 FUGRO NATIONAL INC LONG BEACH CA F/G 13/2
VERIFICATION STUDY - WAH WAH VALLEY, UTAH. VOLUME II. GEOTECHNI--ETC(U)
MAR 81 F04704-80-C-0006
UNCLASSIFIED FN-TR-27-WA-VOL-2 NL

3 OF 4
AD A
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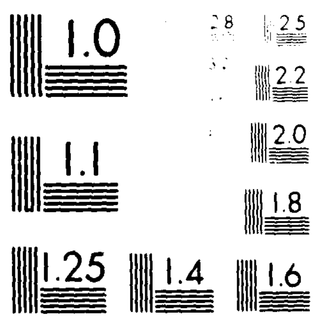
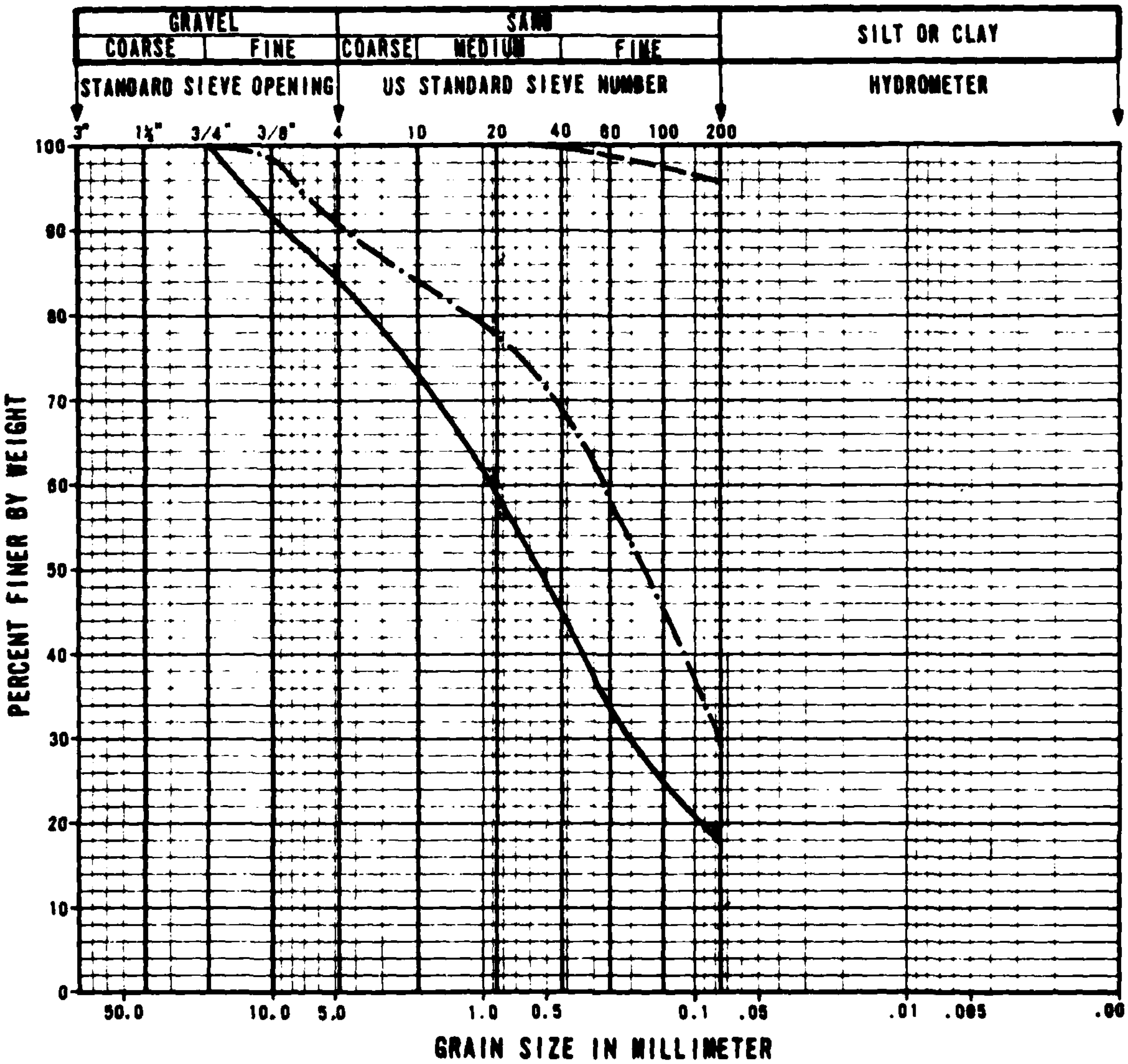
3393





SYMBOL	COMPOSITE SAMPLE NUMBER	ACTIVITY NUMBER	SAMPLE INTERVAL FEET	SAMPLE INTERVAL METERS	SOIL TYPE
———	N	WA-F-3	3.0 - 3.5	0.91 - 1.07	SM
— —	O	WA-F-7	3.0 - 3.5	0.91 - 1.07	ML
—·—	P	WA-F-8	1.0 - 1.5	0.30 - 0.46	SM

GRAIN SIZE CURVES, CBR TESTS
WAH WAH VALLEY, UTAH

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - BMO

FIGURE II-8-2
5 OF 5

FUGRO NATIONAL, INC.

COMPOSITE SAMPLE NUMBER	SOIL TYPE	PERCENT PASSING #200	ATTERBERG LIMITS LL	ATTERBERG LIMITS PI	SPECIFIC GRAVITY	MAXIMUM DRY DENSITY pcf	MAXIMUM DRY DENSITY kg/m³	OPTIMUM MOISTURE (%)	COMPACTED DRY DENSITY pcf	COMPACTED DRY DENSITY kg/m³	COMPACTED MOISTURE (%)	PERCENT OF MAXIMUM DRY DENSITY	CBR (%)
A	SM	17				127.8	2047	9.7	125.0	2003	11.1	97.8	119
									117.5	1882	9.7	91.9	35
									111.5	1786	9.9	87.3	12
B	CL-ML	52	25	4	2.69	121.4	1945	12.7	111.5	1786	13.0	91.8	21
									106.0	1698	12.7	87.3	13
									94.6	1515	13.0	77.9	4
C	CL	59	33	15		116.4	1865	14.9	109.7	1757	15.2	94.2	4
									100.9	1616	15.1	86.7	3
									88.2	1413	15.2	75.8	1
D	SW-SM	8				131.0	2099	9.1	126.6	2028	9.0	96.7	73
									120.1	1924	9.5	91.7	42
									113.5	1818	9.3	86.6	9

CALIFORNIA BEARING RATIO (CBR)
TEST RESULTS
WAH WAH VALLEY, UTAH

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - BMO

TABLE II-8-6
1 OF 4

FUGRO NATIONAL, INC.

COMPOSITE SAMPLE NUMBER	SOIL TYPE	PERCENT PASSING #200	ATTERBERG LIMITS		SPECIFIC GRAVITY	MAXIMUM DRY DENSITY		OPTIMUM MOISTURE (%)	COMPACTED DRY DENSITY		COMPACTED MOISTURE (%)	PERCENT OF MAXIMUM DRY DENSITY	CBR (%)
			LL	PI		pcf	kg/m³		pcf	kg/m³			
E	SC	40	29	11	2.66	124.5	1994	11.4	114.5	1834	11.5	91.9	4
									106.6	1708	11.6	85.7	2
									97.5	1562	11.5	78.3	2
F	GM	17				133.5	2139	8.8	130.9	2097	8.4	98.0	47
									127.3	2039	7.2	95.3	22
									117.4	1881	7.3	87.9	3
G	SP	3				133.6	2140	8.5	120.5	1930	8.4	90.2	30
									117.1	1876	8.1	87.7	30
[illegible]	ML	86		NP	2.64	109.5	1754	17.4	98.9	1586	18.0	90.3	10
									101.2	1621	17.7	92.4	7
									89.0	1424	17.4	81.2	4

CALIFORNIA BEARING RATIO (CBR)
TEST RESULTS
WAH WAH VALLEY, UTAH

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - BMO

TABLE
II-8-6
2 OF 4

FUGRO NATIONAL, INC.

COMPOSITE SAMPLE NUMBER	SOIL TYPE	PERCENT PASSING #200	ATTERBERG LIMITS		SPECIFIC GRAVITY	MAXIMUM DRY DENSITY		OPTIMUM MOISTURE (%)	COMPACTED DRY DENSITY		COMPACTED MOISTURE (%)	PERCENT OF MAXIMUM DRY DENSITY	CBR (%)
			LL	PI		pcf	kg/m^3		pcf	kg/m^3			
I	SM	27				118.5	1898	14.0	108.6	1738	13.4	91.6	32
									99.7	1596	14.8	84.1	11
									91.2	1461	13.8	77.0	3
J	SM	25				125.7	2014	11.0	116.1	1860	11.1	92.4	34
									108.2	1733	11.3	86.1	8
									101.1	1620	11.5	80.4	3
K	CL-ML	90	28	6		114.6	1836	15.7	106.1	1700	16.0	92.6	11
									100.4	1608	16.0	87.6	7
									88.0	1410	16.0	76.8	3
L	SM	18			2.69	124.9	2001	10.6	118.8	1903	11.0	95.1	68
									109.6	1756	10.6	87.8	23
									102.0	1634	10.5	81.7	4

CALIFORNIA BEARING RATIO (CBR)
TEST RESULTS
WAH WAH VALLEY, UTAH

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - BMO

TABLE
II-8-6
3 OF 4

FUGRO NATIONAL, INC.

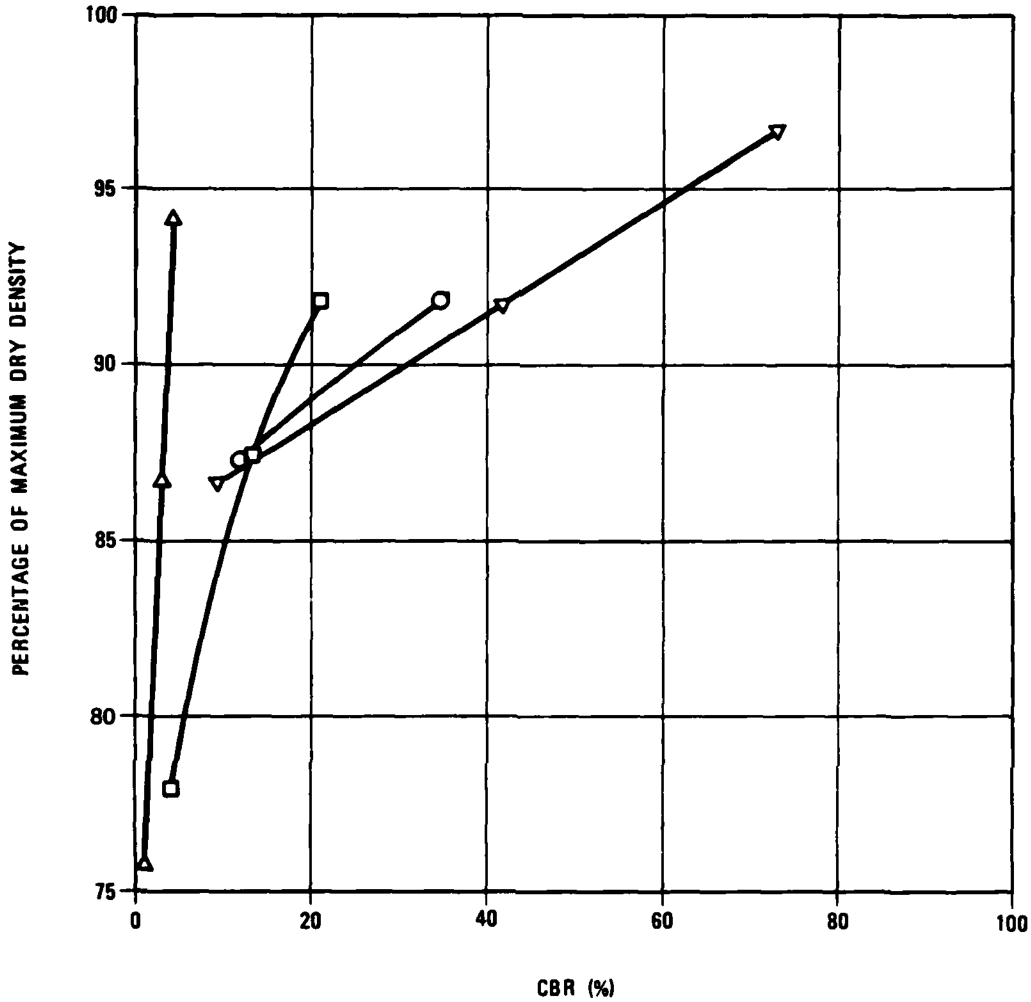
COMPOSITE SAMPLE NUMBER	SOIL TYPE	PERCENT PASSING #200	ATTERBERG LIMITS		SPECIFIC GRAVITY	MAXIMUM DRY DENSITY		OPTIMUM MOISTURE (%)	COMPACTED DRY DENSITY		COMPACTED MOISTURE (%)	PERCENT OF MAXIMUM DRY DENSITY	CBR (%)
			LL	PI		pcf	kg/m³		pcf	kg/m³			
M	SM	13				121.8	1951	12.0	112.5	1802	12.2	92.3	27
									103.6	1660	12.1	85.1	7
									96.6	1548	12.6	79.3	3
N	SM	18				125.8	2015	10.5	117.5	1882	10.1	93.4	37
									110.8	1775	10.6	88.1	12
									109.2	1749	9.3	86.8	6
O	ML	95	47	9		102.3	1639	22.0	89.9	1440	23.2	87.9	7
									86.2	1381	23.1	84.3	5
									81.5	1306	22.7	79.6	4
P	SM	29				126.7	2030	10.0	114.8	1837	10.5	90.6	18
									112.6	1804	9.9	88.9	10
									101.8	1631	9.8	80.4	1

CALIFORNIA BEARING RATIO (CBR)
TEST RESULTS
WAH WAH VALLEY, UTAH

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - BMO

TABLE II-8-6
4 OF 4

FUGRO NATIONAL, INC.



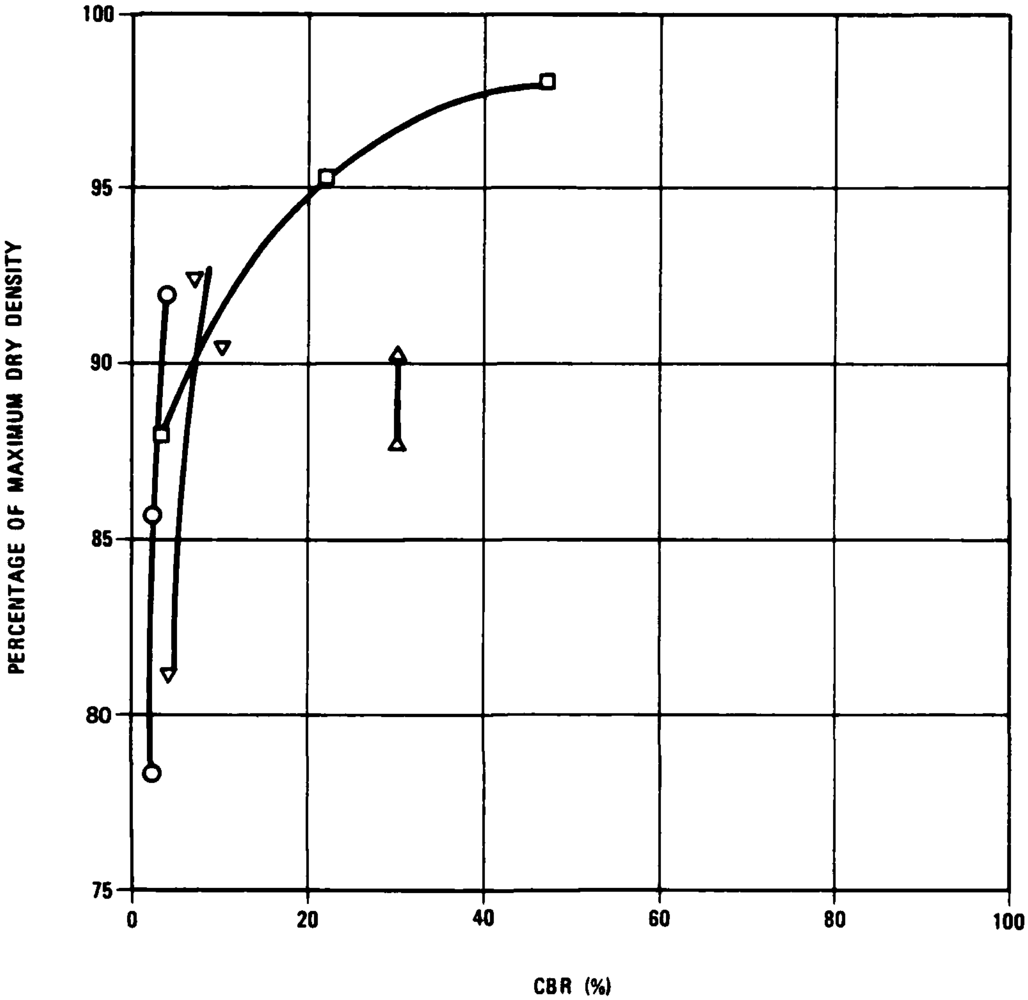
SYMBOL	COMPOSITE SAMPLE NUMBER	SOIL TYPE
○	A	SM
□	B	CL-ML
△	C	CL
▽	D	SW-SM

CALIFORNIA BEARING RATIO (CBR) CURVES
WAH WAH VALLEY, UTAH

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE — BMO

FIGURE II-8-3
1 OF 4

FUGRO NATIONAL, INC.



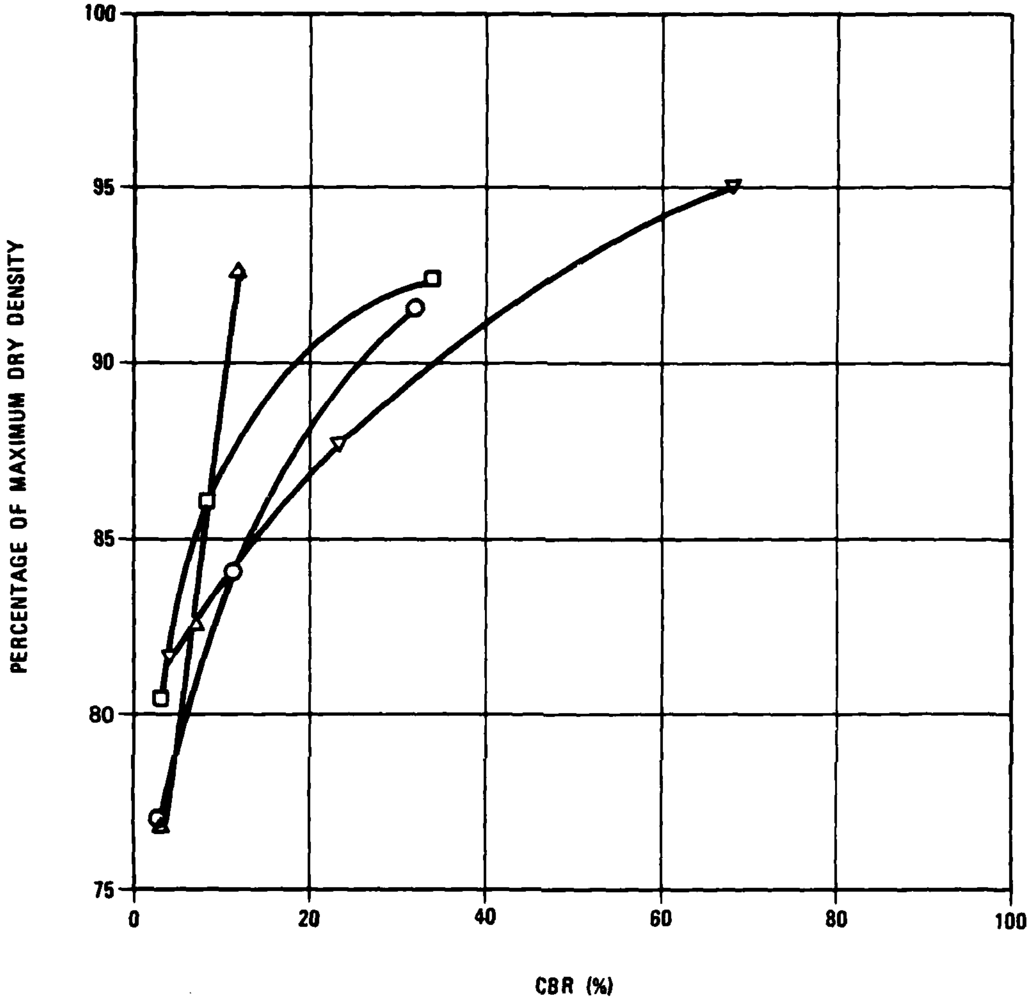
SYMBOL	COMPOSITE SAMPLE NUMBER	SOIL TYPE
○	E	SC
□	F	GM
△	G	SP
▽	H	ML

CALIFORNIA BEARING RATIO (CBR) CURVES
WAH WAH VALLEY, UTAH

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE – BMO

FIGURE II-8-3
2 OF 4

FUGRO NATIONAL, INC.



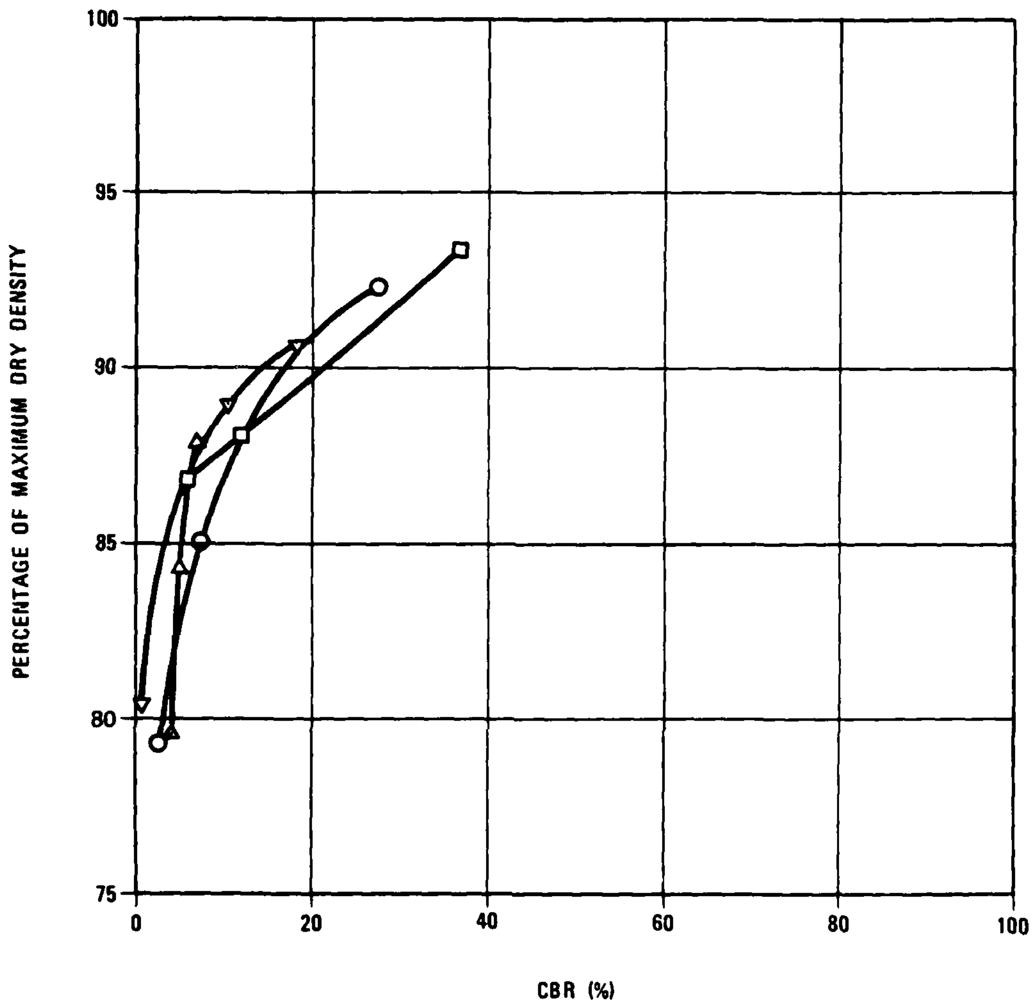
SYMBOL	COMPOSITE SAMPLE NUMBER	SOIL TYPE
○	I	SM
□	J	SM
△	K	CL-ML
▽	L	SM

CALIFORNIA BEARING RATIO (CBR) CURVES
WAH WAH VALLEY, UTAH

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE — BMO

FIGURE
II-8-3
3 OF 4

FUGRO NATIONAL, INC.



SYMBOL	COMPOSITE SAMPLE NUMBER	SOIL TYPE
○	M	SM
□	N	SM
△	O	ML
▽	P	SM

CALIFORNIA BEARING RATIO (CBR) CURVES
WAH WAH VALLEY, UTAH

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE – BMO

FIGURE
II-8-3
4 OF 4

FUGRO NATIONAL, INC.

9.0 FIELD CALIFORNIA BEARING RATIO (CBR) TEST RESULTS

Explanation: The results of the field CBR tests are tabulated in this section. Explanations of the column headings in Table II-9-1 follow.

A. Designations - Field CBR tests are identified as follows:

WA - F-1
WA - abbreviation for the valley (e.g., WA-Wah Wah)
F - abbreviation for field CBR
1 - number of activity

B. Ground Surface Elevation - Indicated elevations on the logs are estimated from topographic maps of the study area within an accuracy of half the contour interval.

C. Surficial Geologic Unit - Indicates the surficial geologic unit in which the activity is located.

D. Depth - Indicates depth interval for which soil description is given.

E. USCS - Unified Soil Classification Symbol; see Table II-5-1 of Section 5.0, "Boring Logs," for details of USCS.

F. Grain Size Distribution and Plasticity - These are from results of laboratory tests. See Section 5.0, "Boring Logs," for explanation.

G. In Situ Dry Unit Weight - These are from results of field tests performed in accordance with the American Society for

Testing and Materials (ASTM) procedure D 1556-64, "Test for Density of Soil in Place by the Sand-Cone Method."

H. Moisture Content - These are from results of laboratory tests performed in accordance with ASTM procedure D 2216-71, "Laboratory Determination of Moisture Content of Soil."

I. Estimated Percent of Maximum Dry Density - This indicates the ratio (as a percentage) of the in situ dry unit weight obtained in the laboratory from ASTM D 1557-70, "Moisture-Density Relations of Soils Using 10-pound (4.5-kg) Hammer and 18-inch (457-mm) Drop" at that site or from a compatible site with matching grain size distribution.

J. Average Field CBR - The CBR is the ratio of the resistance to penetration developed by a soil to that developed by a standard crushed-rock base material. The procedures used for calculating the field CBR values are as outlined in the U.S. Army Corps of Engineers Technical Manual (TM) 5-30, pp. 2-86 to 2-96.

ACTIVITY NUMBER	GROUND SURFACE ELEVATION		SURFICIAL GEOLOGIC UNIT	DEPTH		USCS	GRAIN SIZE DISTRIBUTION AND PLASTICITY					IN SITU DRY UNIT WEIGHT		MOISTURE CONTENT (%)	ESTIMATED PERCENT OF MAXIMUM DRY DENSITY	AV FIE
	FEET	METERS		FEET	METERS		GR	SA	FI	LL	PI	(pcf)	(kg m3)			
WA-F-1	4915	1498	A5y/A4o	1.0	0.30	CL	1	46	53	32	13	86.2	1381	7.8	71	
				2.0	0.61	SM	1	66	33			77.5	1242	5.8	61	
				3.0	0.91	SM	0	64	36			85.2	1365	6.6	67	
				4.0	1.22	ML	4	45	51			69.4	1112	6.6	57	
WA-F-2	4950	1509	A5y	1.0	0.30	SM	5	70	25			82.7	1325	7.3	66	
				2.0	0.61	SM	4	83	13			100.0	1602	5.0	82	
				3.0	0.91	SW-SM	37	57	6			107.0	1714	3.2	82	
WA-F-3	5230	1594	A5y	1.0	0.30	SM	15	65	20			93.9	1504	5.6	75	
				2.0	0.61	SM	12	64	24			87.3	1399	5.5	70	
				3.0	0.91	SM	16	66	18			94.7	1517	4.6	75	
				4.0	1.22	SM	12	73	15			95.5	1530	4.9	76	
WA-F-4	5025	1532	A4o/A5y	1.0	0.30	SM-SC	1	64	35	25	7	87.2	1397	5.4	69	
				2.0	0.61	SM-SC						81.2	1301	7.6	64	
				3.0	0.91	CL	0	29	71	43	18	75.5	1210	10.9	65	
				4.0	1.22	CL						97.1	1556	4.6	77	
WA-F-5	4655	1419	A4o	1.0	0.30	CL-ML	0	16	84	25	7	83.6	1339	8.7	73	
				2.0	0.61	CL-ML	0	13	87	25	5	76.5	1226	7.9	67	
				3.0	0.91	CL	0	35	65	26	8	79.4	1272	9.3	68	
				4.0	1.22	CL						67.6	1083	11.5	58	
WA-F-6	4670	1423	A4o/A5y	1.0	0.30	SM	4	73	23			88.6	1419	4.5	71	
				2.0	0.61	SM	17	65	18			85.7	1373	4.4	68	
WA-F-7	4650	1417	A5y/A4o	1.0	0.30	ML	0	14	86	35	8	68.4	1096	11.3	63	
				2.0	0.61	ML						63.1	1011	11.5	58	
				3.0	0.91	ML	0	5	95	47	9	57.3	918	14.6	56	
				4.0	1.22	ML	0	3	97	49	14	59.6	955	12.5	58	
WA-F-8	4755	1449	A4o/A5y	1.0	0.30	SM	9	62	29			97.0	1554	4.5	77	
				2.0	0.61	SM	10	66	24			97.9	1568	7.7	77	

ESTIMATED PERCENT OF MAXIMUM DRY DENSITY	AVERAGE FIELD CBR (%)	REMARKS
71	8	Maximum dry density from (WA T 3)
61	5	Maximum dry density from (WA-F 8)
67	6	
57	8	Cementation
66	8	Maximum dry density from (WA P-4)
82	8	Soil inconsistent throughout 2.0' level
82		No field CBR performed, maximum dry density from (WA-T 10)
75	6	
70	7	Maximum dry density from (WA-P-4)
75	8	Large gravel in field density hole
76	4	
69	15	Maximum dry density from (WA-F-8)
64	8	
65	8	Maximum dry density from (WA-T 4)
77		No field CBR performed, maximum dry density from (WA F 8)
73	15	Maximum dry density from (WA P 16)
67	7	
68	9	Maximum dry density from (WA T 4)
58	5	
71	6	Maximum dry density from (WA-P-4)
68	9	Maximum dry density from (WA-F-3)
63	10	Maximum dry density from (WA-T-15)
58	8	
56	5	
58	10	
77	4	
77	8	

FIELD CBR TEST RESULTS
WAH WAH VALLEY, UTAH

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE BMO

TABLE II-9-1

FUGRO NATIONAL, INC.

AFV-22

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10.0 CONE PENETROMETER TEST RESULTS

Explanation: The drawings in this section show the results of the cone penetrometer tests. The terms used in the drawings are defined below.

A. Depth - Corresponds to depth below ground surface.

B. Friction Resistance - The resistance to penetration developed by the friction sleeve, equal to the vertical force applied to the sleeve divided by its surface area. This resistance is the sum of friction and adhesion.

C. Cone Resistance - The resistance to penetration developed by the cone, equal to the vertical force applied to the cone divided by its horizontally projected area.

D. Friction Ratio - The ratio of friction resistance to cone resistance.

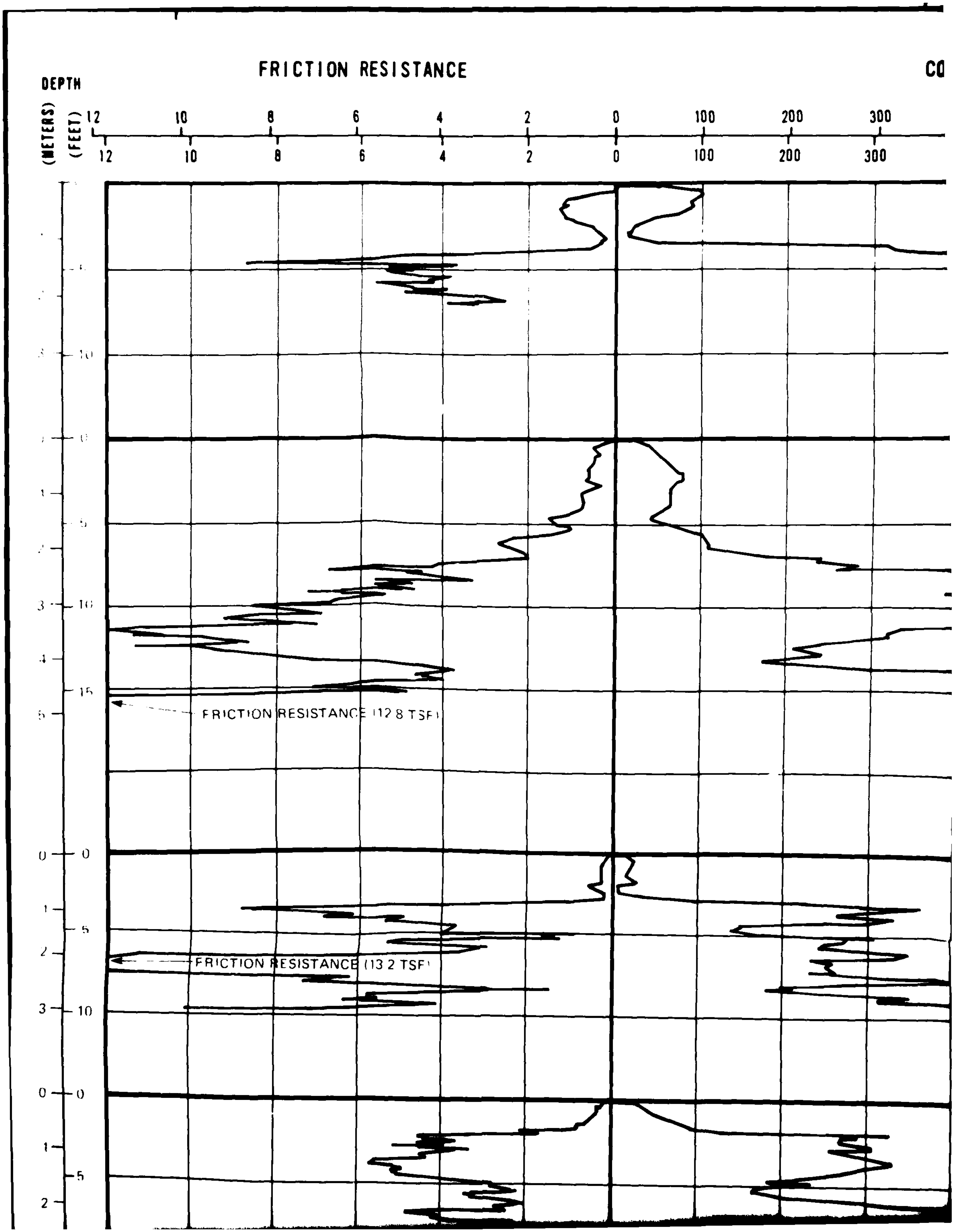
E. Designation - Each cone penetrometer test is identified by a number: for example C-1.

    C - abbreviation for the CPT
    1 - number of the test

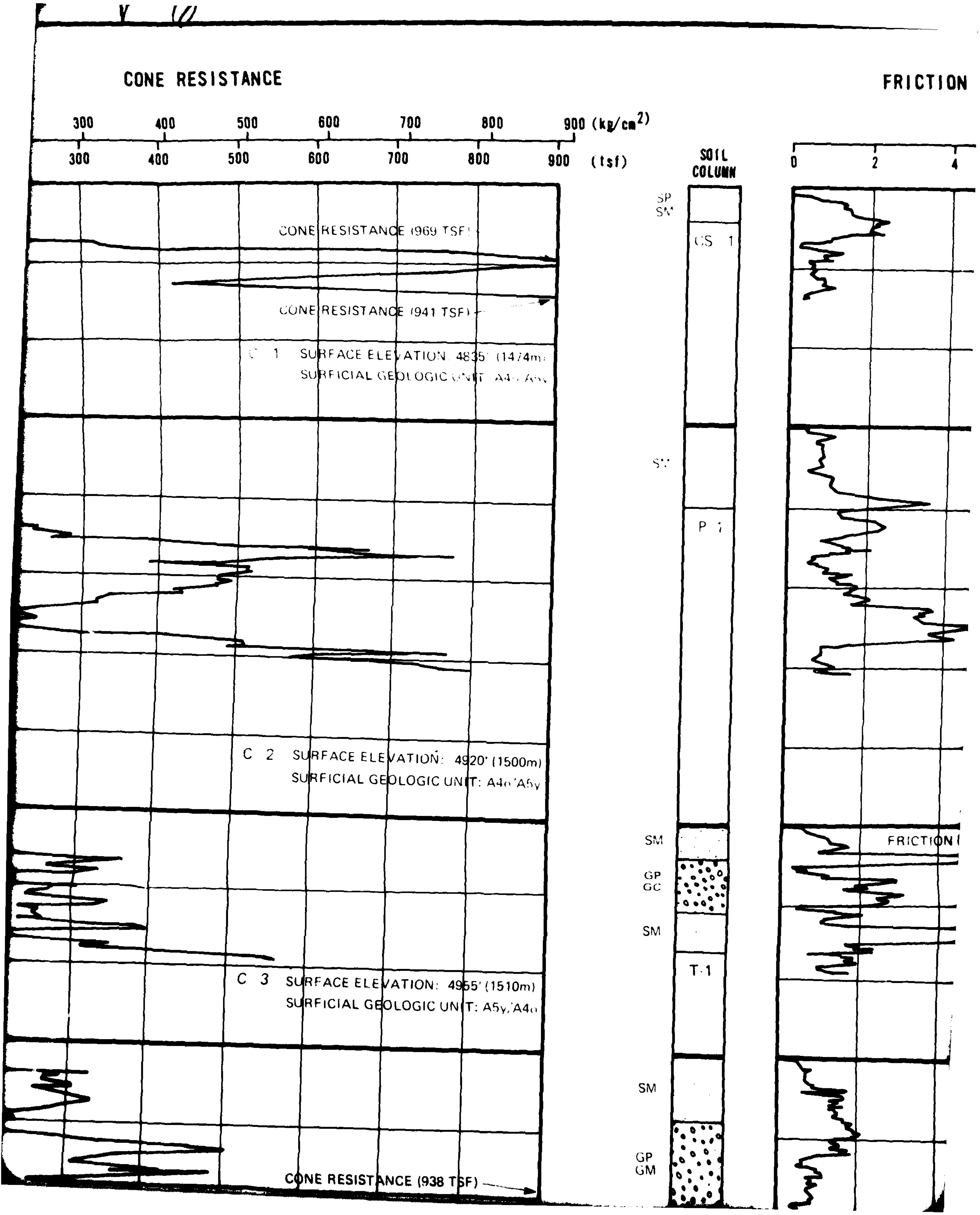
F. Surface Elevation - Indicated elevations on the drawings are estimated from topographic maps of the study area and are accurate within one-half the contour interval.

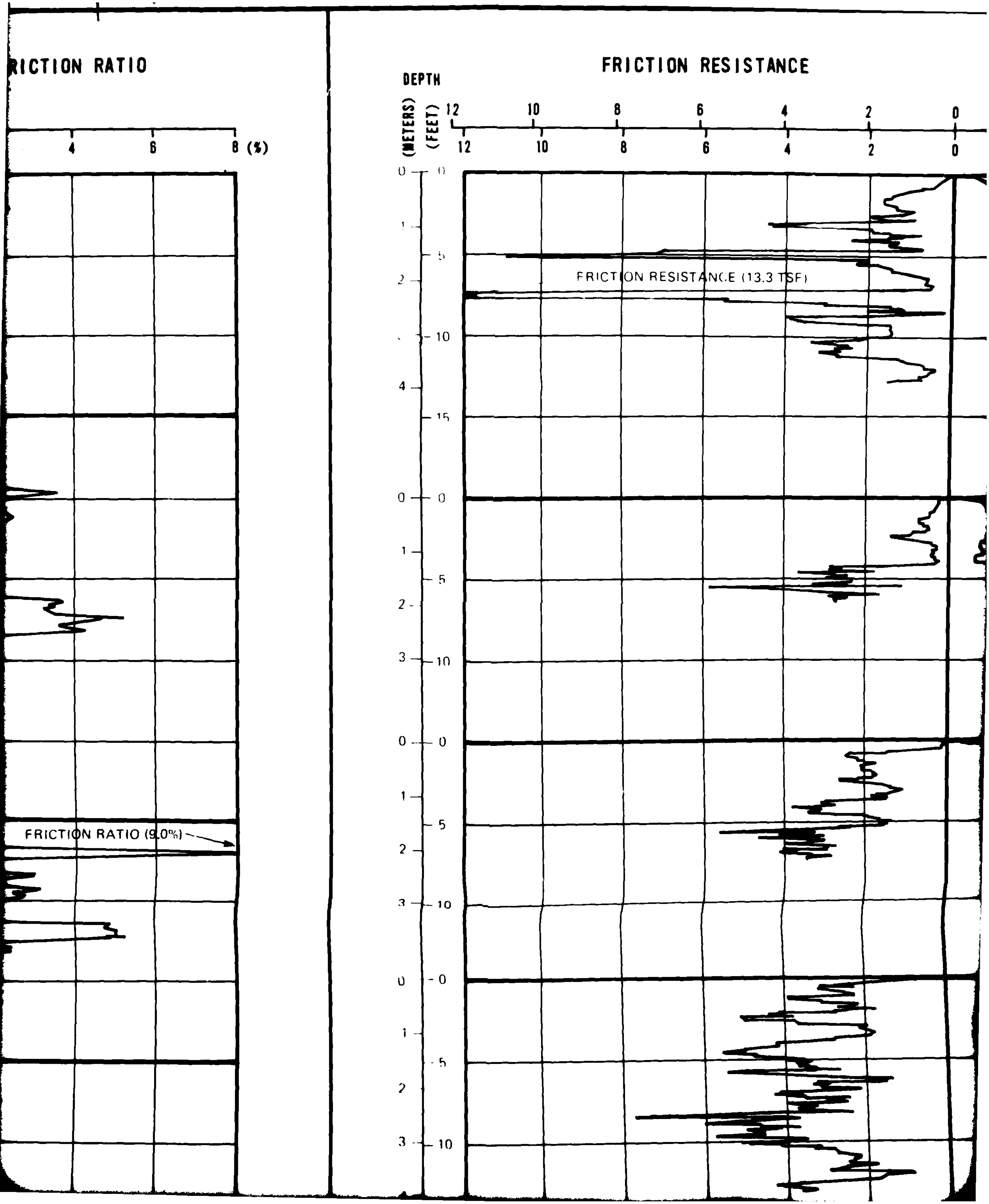
G. Surficial Geologic Unit - Indicates the surficial geologic unit in which the test was located.

H. Soil Column - A graphical presentation of the soil type versus depth at each cone penetrometer test location. The Unified Soil Classification Symbol for each different soil type is listed immediately to the left of the soil column. Immediately below the soil column, the activity number for the corresponding boring, trench, or test pit, or surficial soil sample at each CPT location is given.

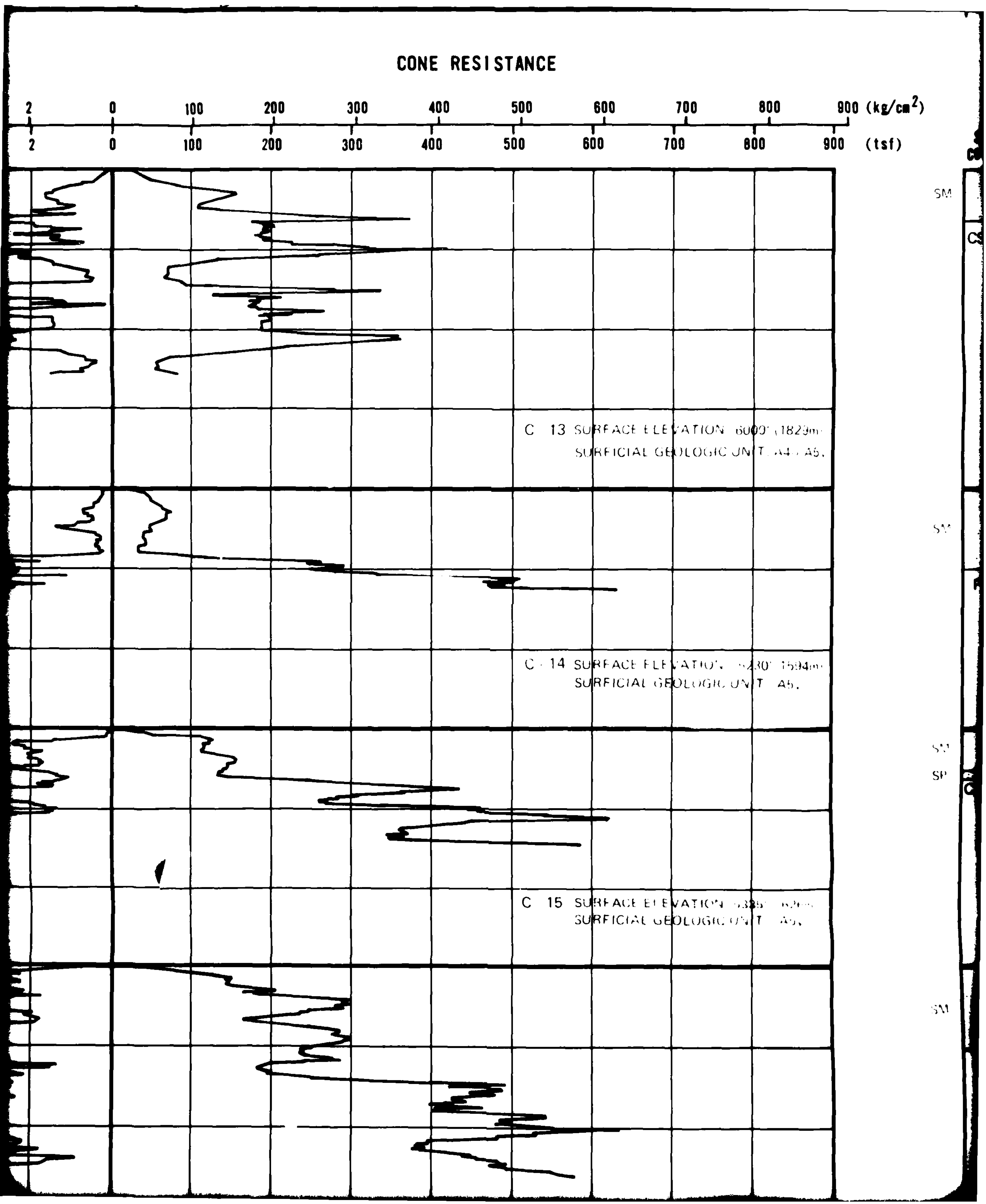


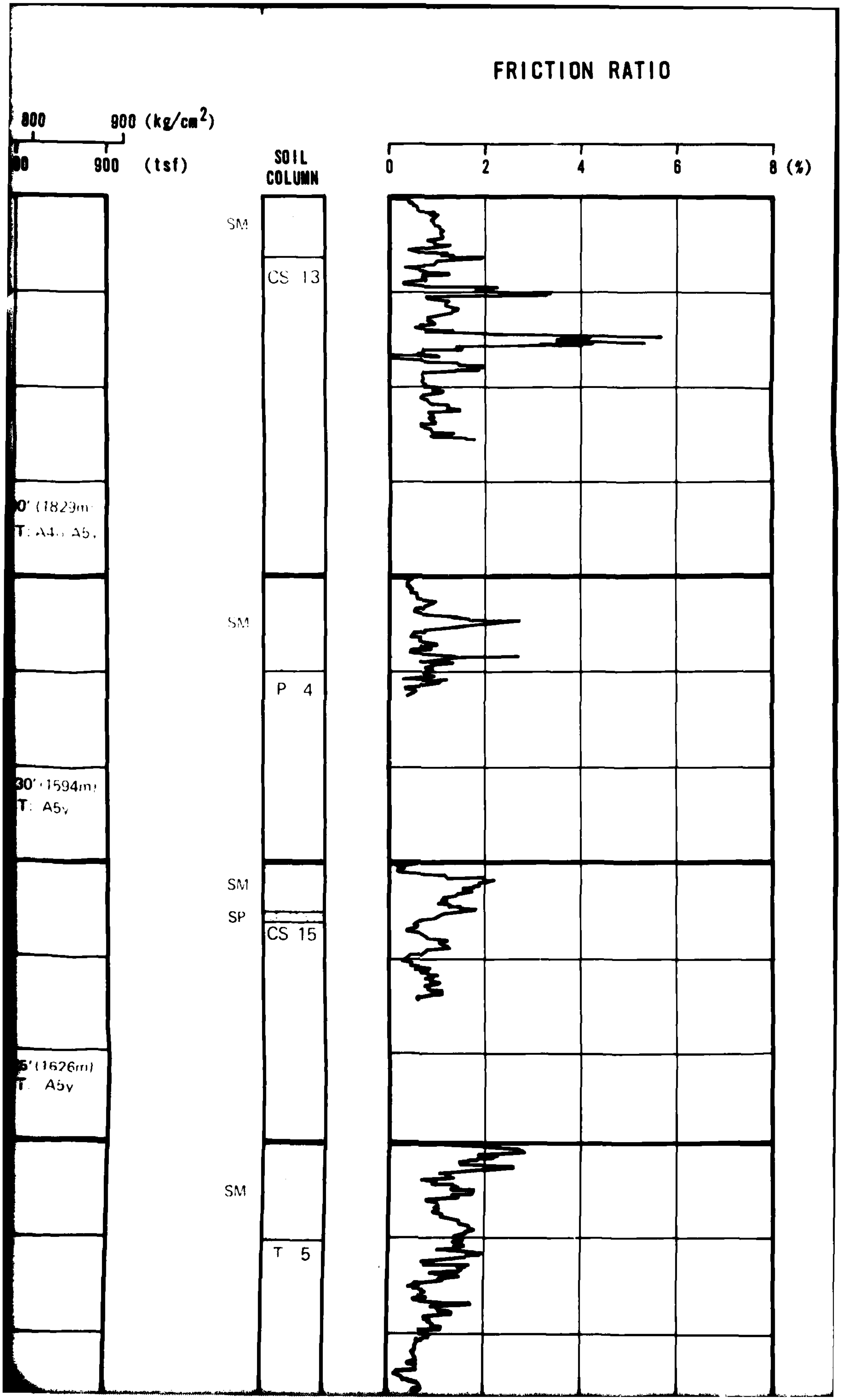
FRICTION RESISTANCE
CO
DEPTH
(METERS)
(FEET)
12
10
8
6
4
2
0
100
200
300
FRICTION RESISTANCE (12 8 TSF)
FRICTION RESISTANCE (13 2 TSF)


CONE RESISTANCE
FRICTION
300 400 500 600 700 800 900 (kg/cm2)
300 400 500 600 700 800 900 (tsf)
SOIL COLUMN
0 2 4
CONE RESISTANCE (969 TSF)
CONE RESISTANCE (941 TSF)
SURFACE ELEVATION: 4835' (1474m)
SURFICIAL GEOLOGIC UNIT
C 2 SURFACE ELEVATION: 4920' (1500m)
SURFICIAL GEOLOGIC UNIT: A4o/A5y
C 3 SURFACE ELEVATION: 4955' (1510m)
SURFICIAL GEOLOGIC UNIT: A5y/A4o
CONE RESISTANCE (938 TSF)
SP
SM
CS 1
SM
P 1
SM
GP
GC
SM
T-1
SM
GP
GM
FRICTION

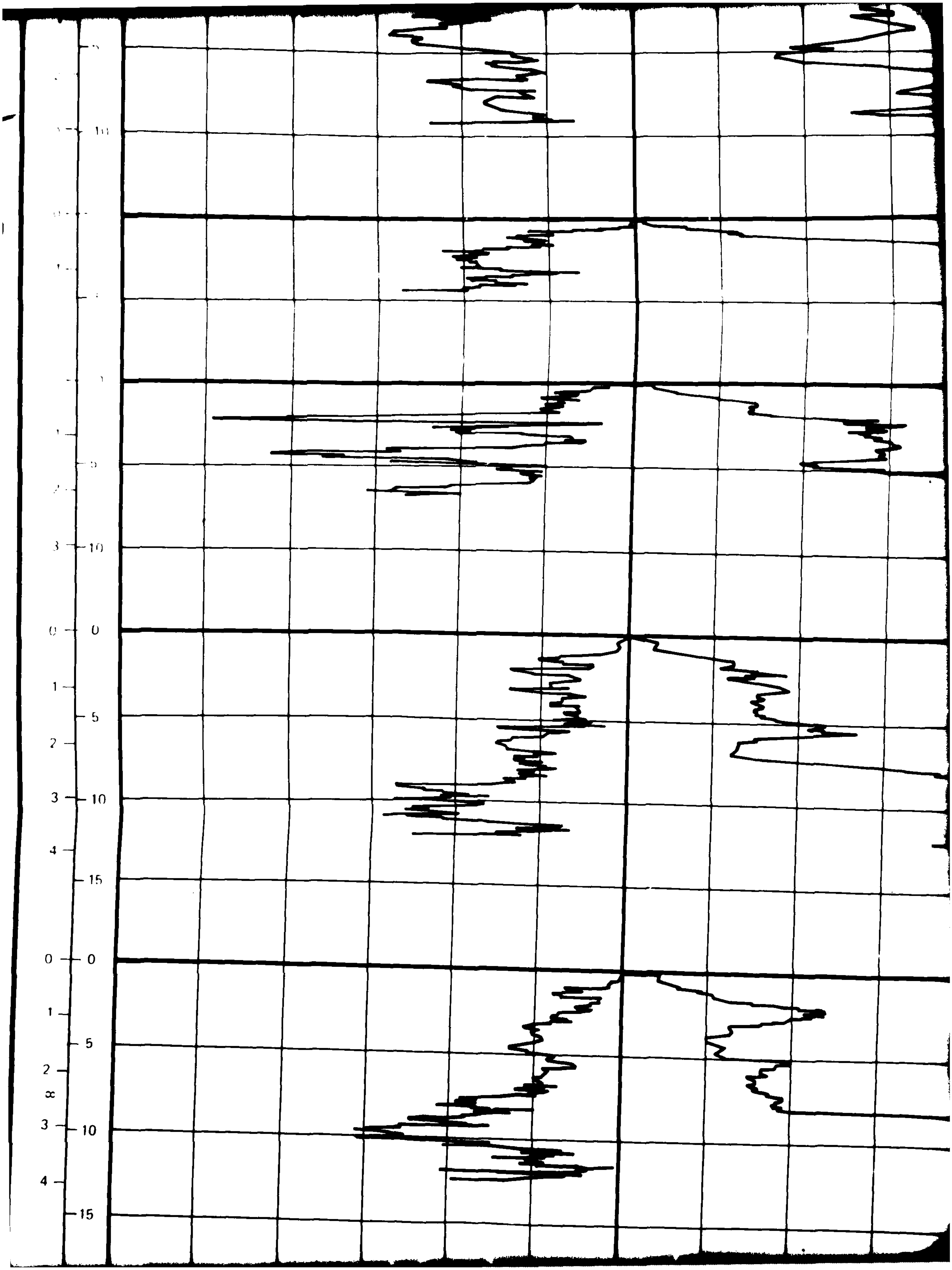


RICTION RATIO
4
6
8 (%)
FRICTION RATIO (9.0%)
FRICTION RESISTANCE
DEPTH
(METERS)
(FEET)
12
10
8
6
4
2
0
FRICTION RESISTANCE (13.3 TSF)

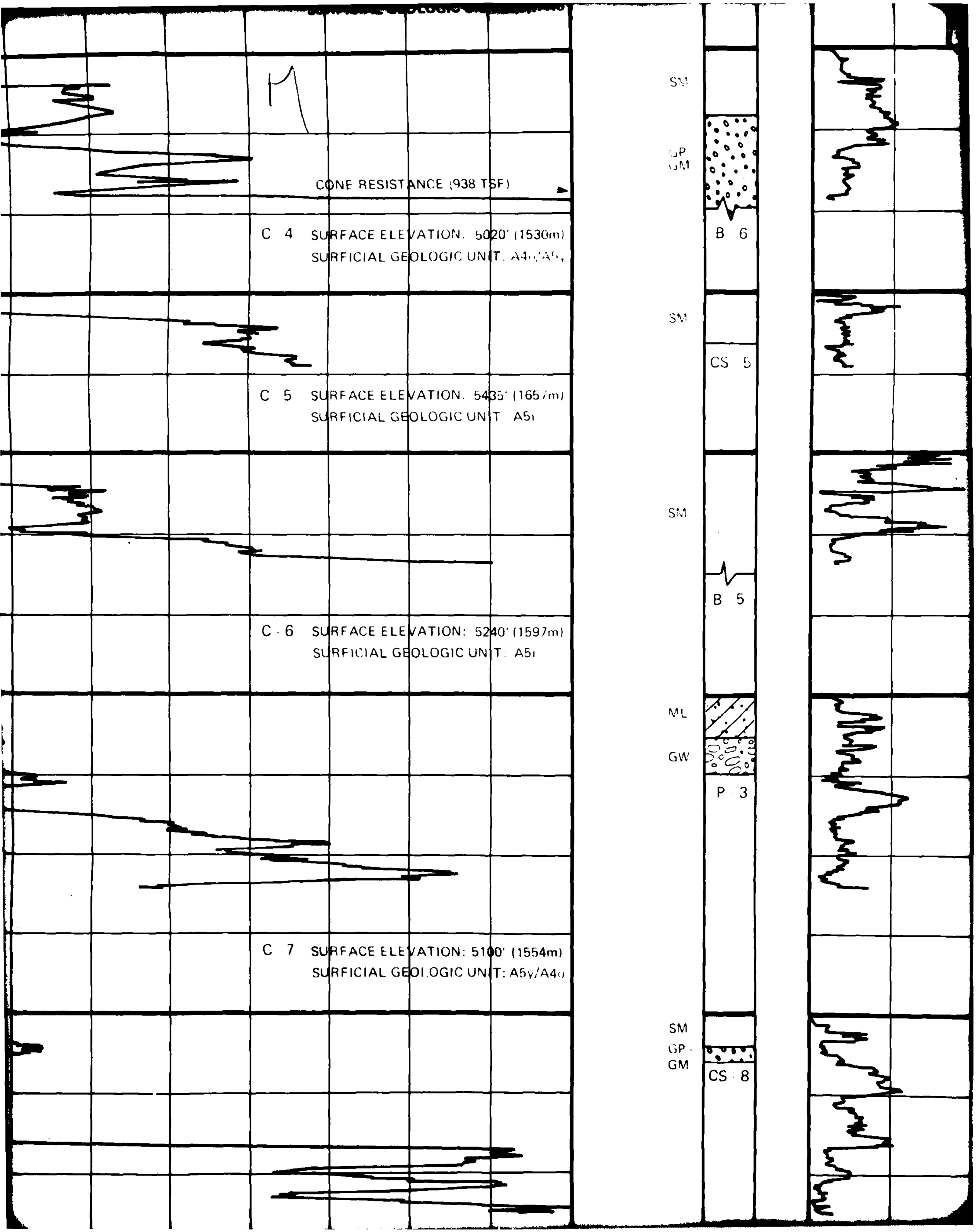

CONE RESISTANCE
2 0 100 200 300 400 500 600 700 800 900 (kg/cm2)
2 0 100 200 300 400 500 600 700 800 900 (tsf)
C 13 SURFACE ELEVATION 6000' (1829m)
SURFICIAL GEOLOGIC UNIT A4, A5.
C-14 SURFACE ELEVATION 5230' 1594m
SURFICIAL GEOLOGIC UNIT A5.
C 15 SURFACE ELEVATION
SURFICIAL GEOLOGIC UNIT
SM
SM
SM
SP
SM

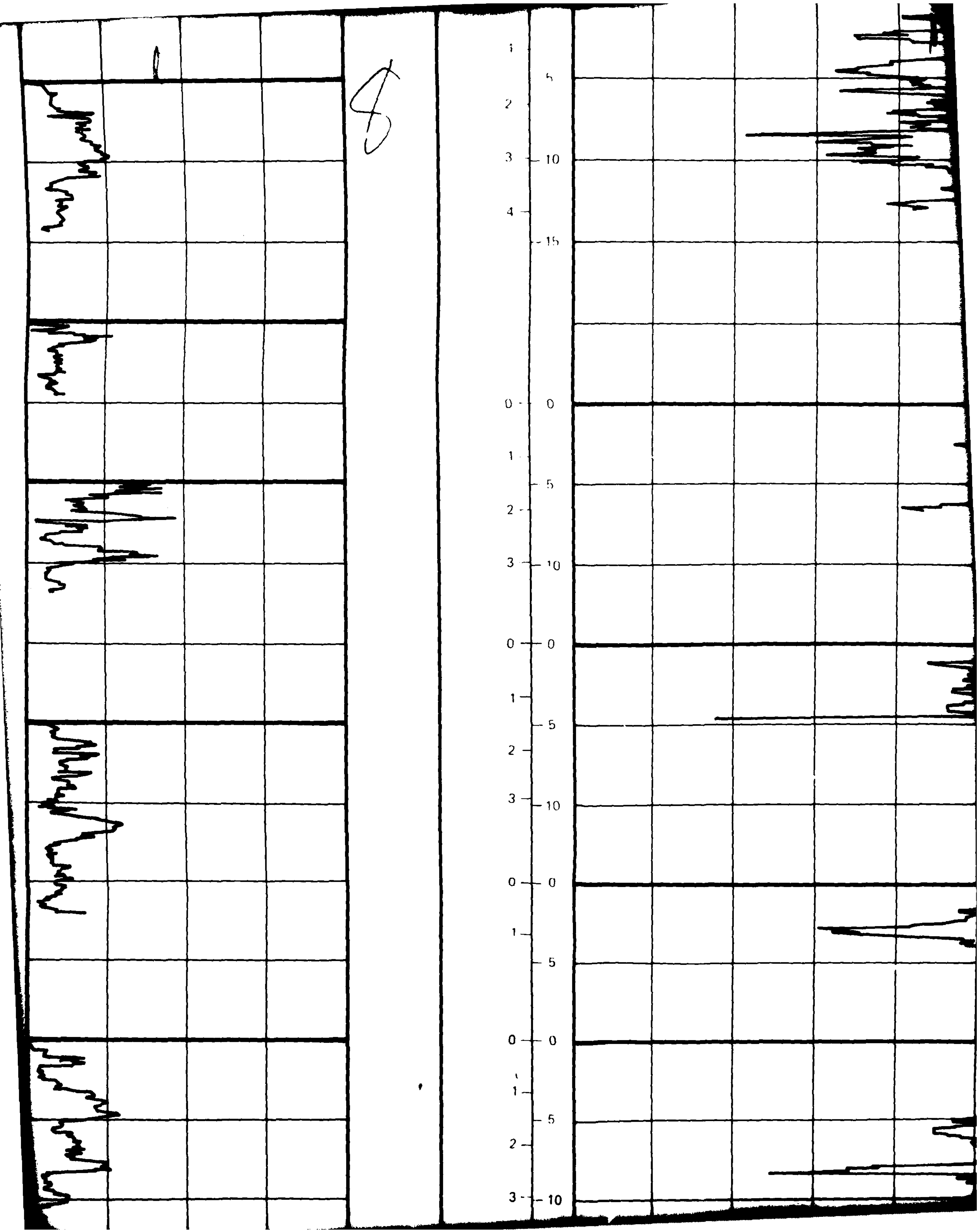


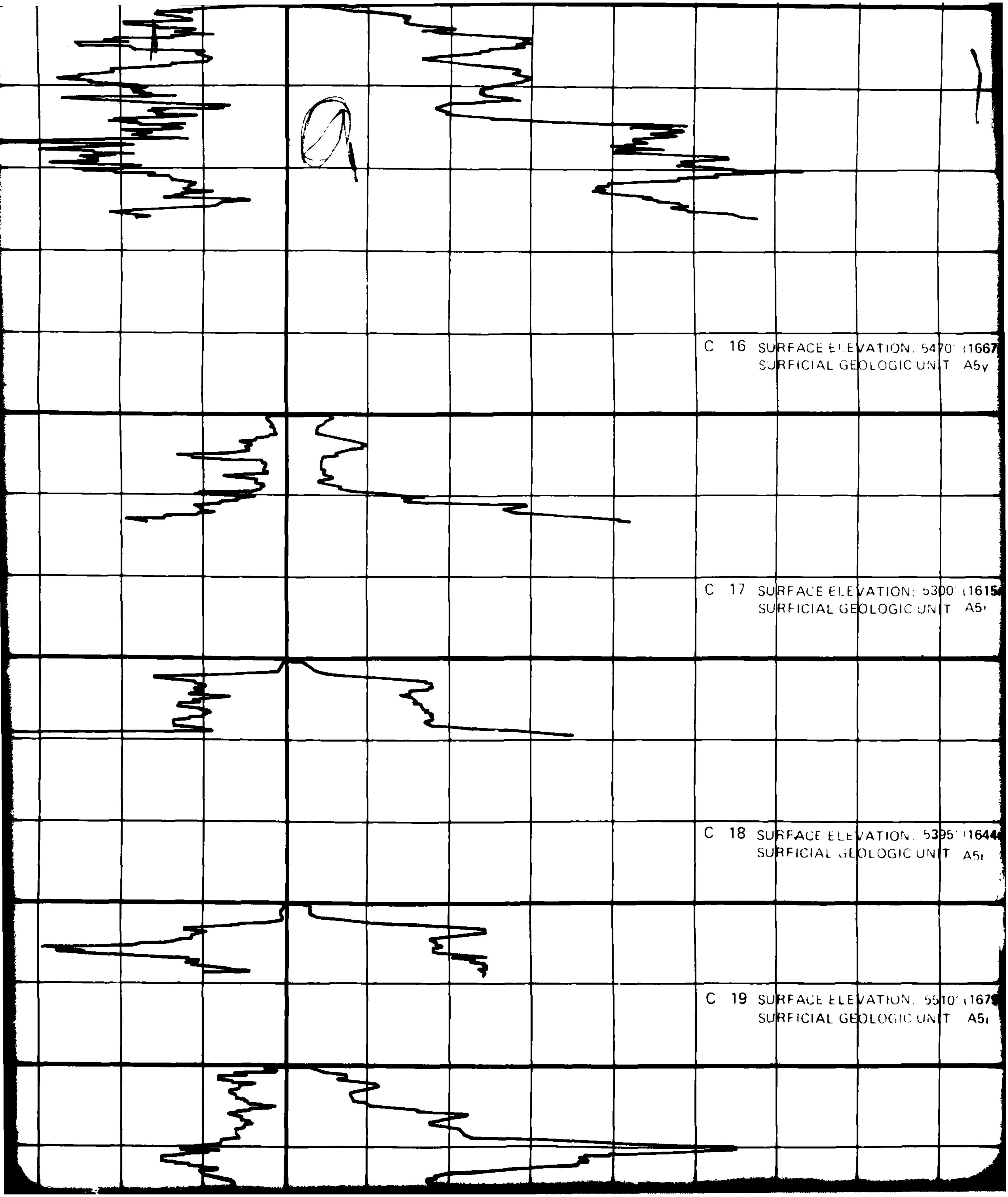
FRICTION RATIO
800
900 (kg/cm2)
900 (tsf)
SOIL COLUMN
0
2
4
6
8 (%)
SM
CS 13
SM
P 4
SM
SP
CS 15
SM
T 5



0
0
1
5
2
3
10
4
15
0
0
1
5
2
∞
3
10
4
15


CONE RESISTANCE (938 TSF)
C 4 SURFACE ELEVATION: 5020' (1530m)
SURFICIAL GEOLOGIC UNIT:
C 5 SURFACE ELEVATION: 5435' (1657m)
SURFICIAL GEOLOGIC UNIT A5i
C-6 SURFACE ELEVATION: 5240' (1597m)
SURFICIAL GEOLOGIC UNIT: A5i
C 7 SURFACE ELEVATION: 5100' (1554m)
SURFICIAL GEOLOGIC UNIT: A5y/A4o
SM
GP
GM
B 6
SM
CS 5
SM
B 5
ML
GW
P-3
SM
GP-
GM
CS-8

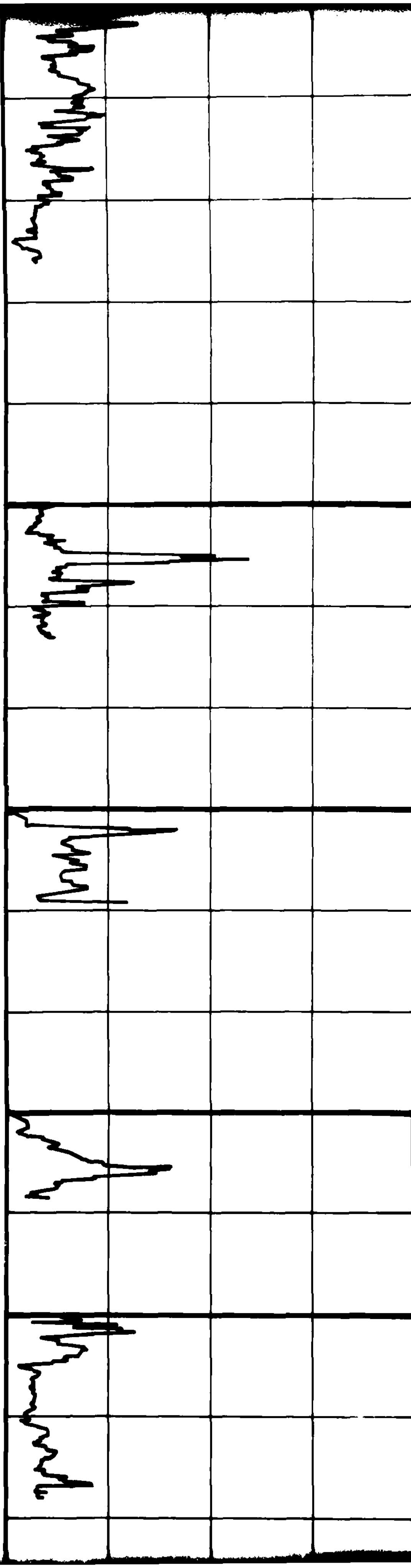

8
1
2
3
4
5
10
15
0
0
1
2
3
5
10
0
0
1
2
3
5
10
0
0
1
5
0
0
1
2
3
5
10


C 16 SURFACE ELEVATION: 5470' (1667
SURFICIAL GEOLOGIC UNIT A5y
C 17 SURFACE ELEVATION: 5300' (1615
SURFICIAL GEOLOGIC UNIT A5i
C 18 SURFACE ELEVATION: 5395' (1644
SURFICIAL GEOLOGIC UNIT A5i
C 19 SURFACE ELEVATION: 5510' (1679
SURFICIAL GEOLOGIC UNIT A5i

SM

T 5

10



FACE ELEVATION: 5470' (1667m)
FICIAL GEOLOGIC UNIT A5

SM

SP
SM

T 6

FACE ELEVATION: 5300' (1615m)
FICIAL GEOLOGIC UNIT A5

SM

CS 18

ACE ELEVATION: 5395' (1644m)
FICIAL GEOLOGIC UNIT A5

SM

SW

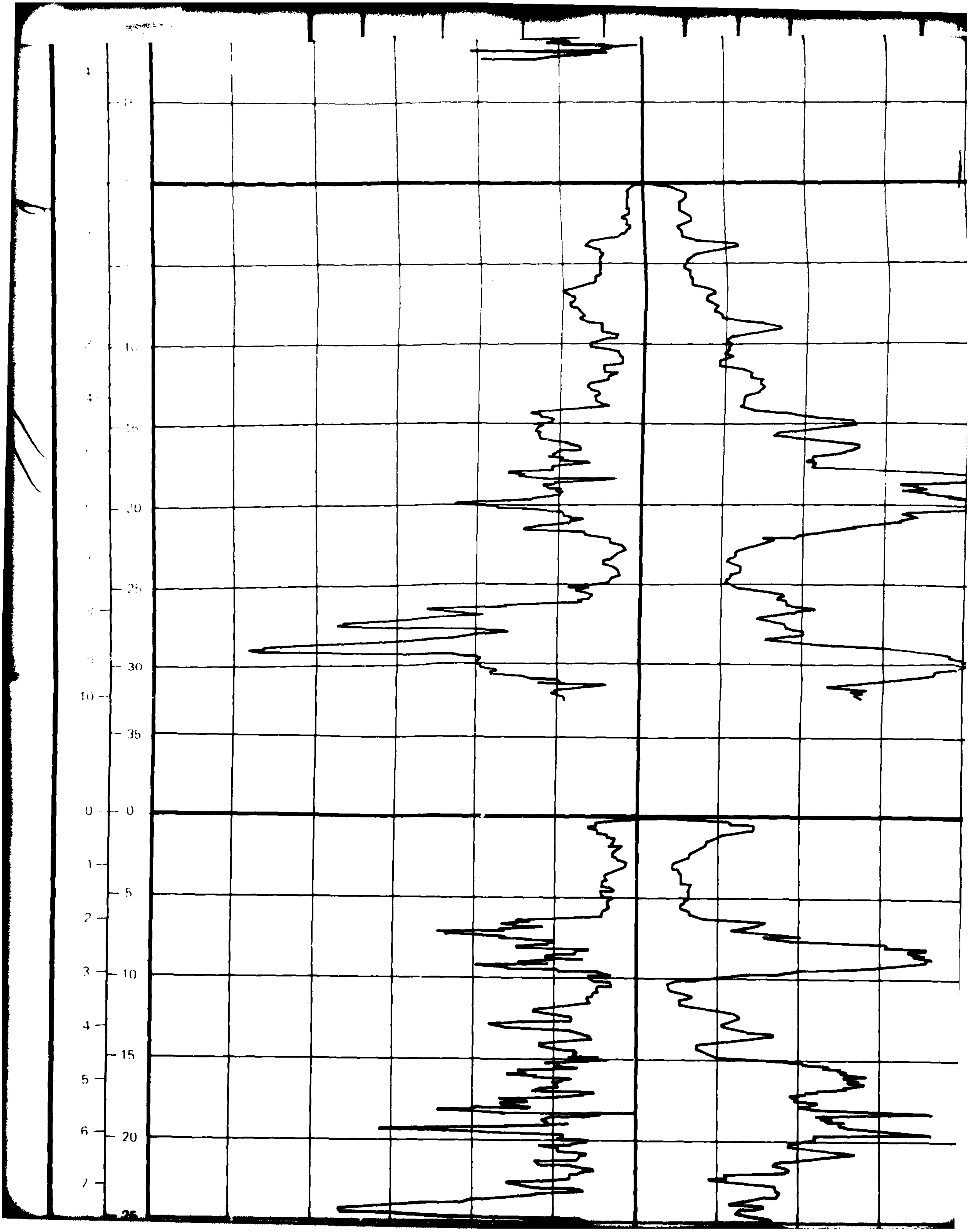
T 7

ACE ELEVATION: 5510' (1679m)
ICIAL GEOLOGIC UNIT A5

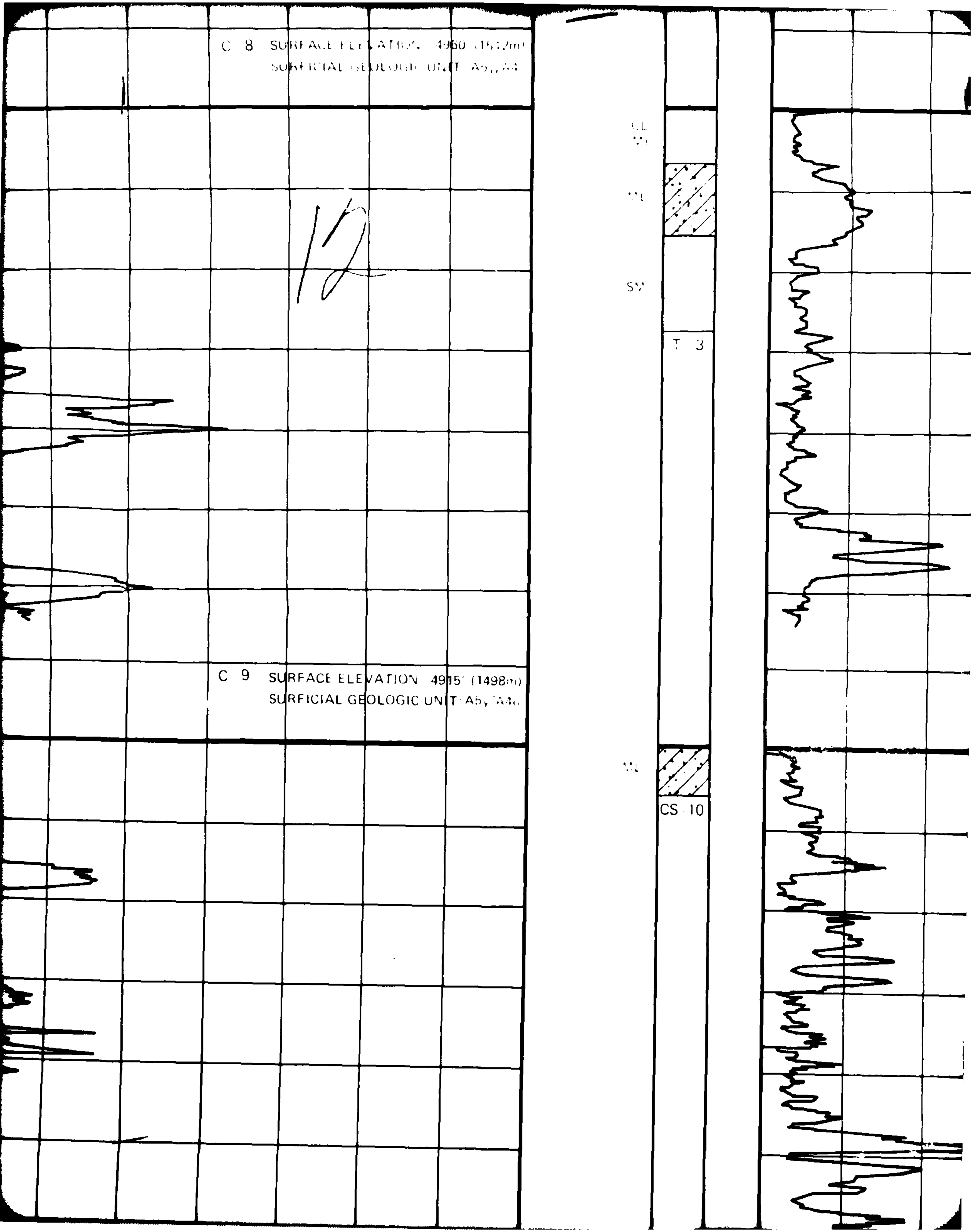
SM

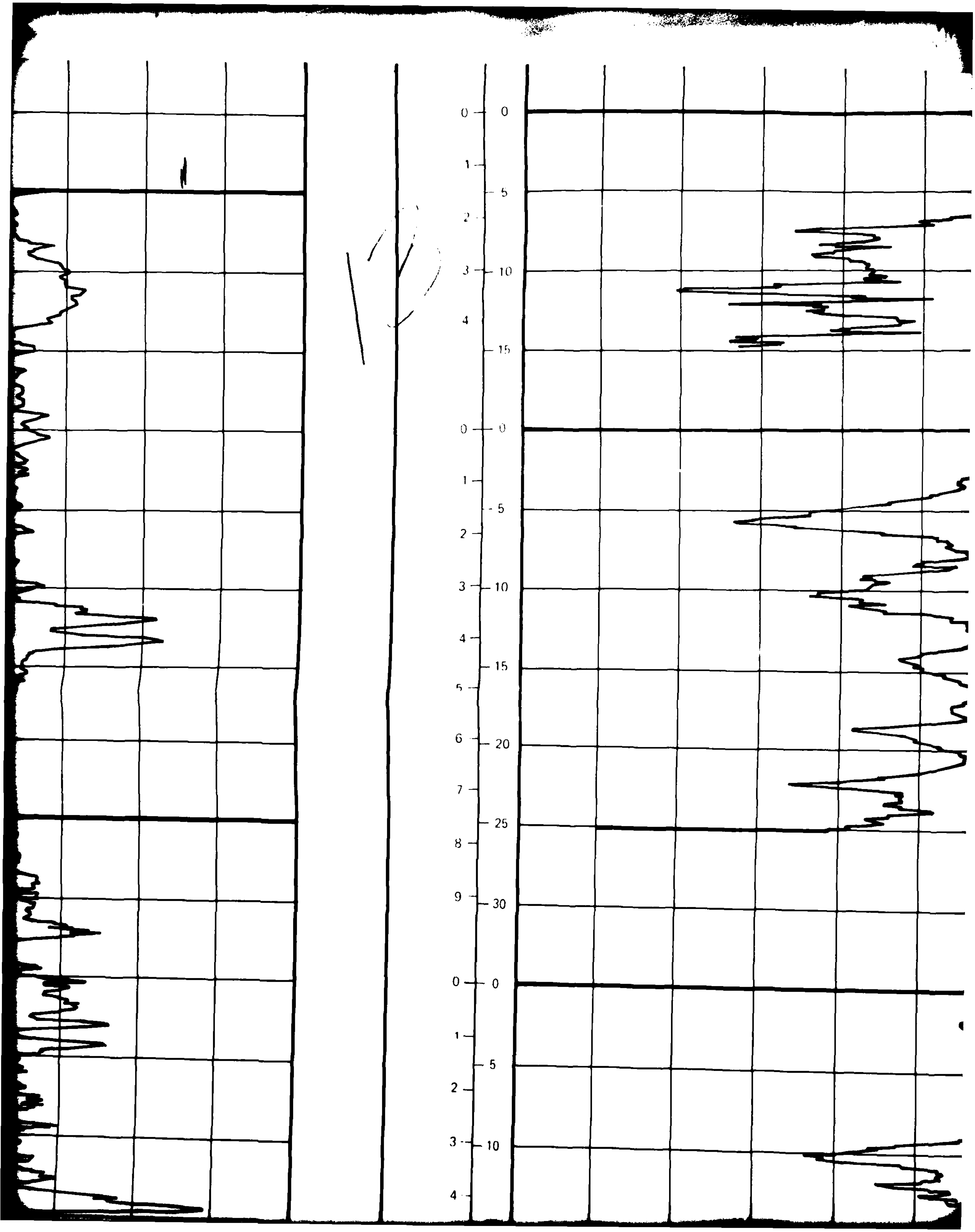
CS 20

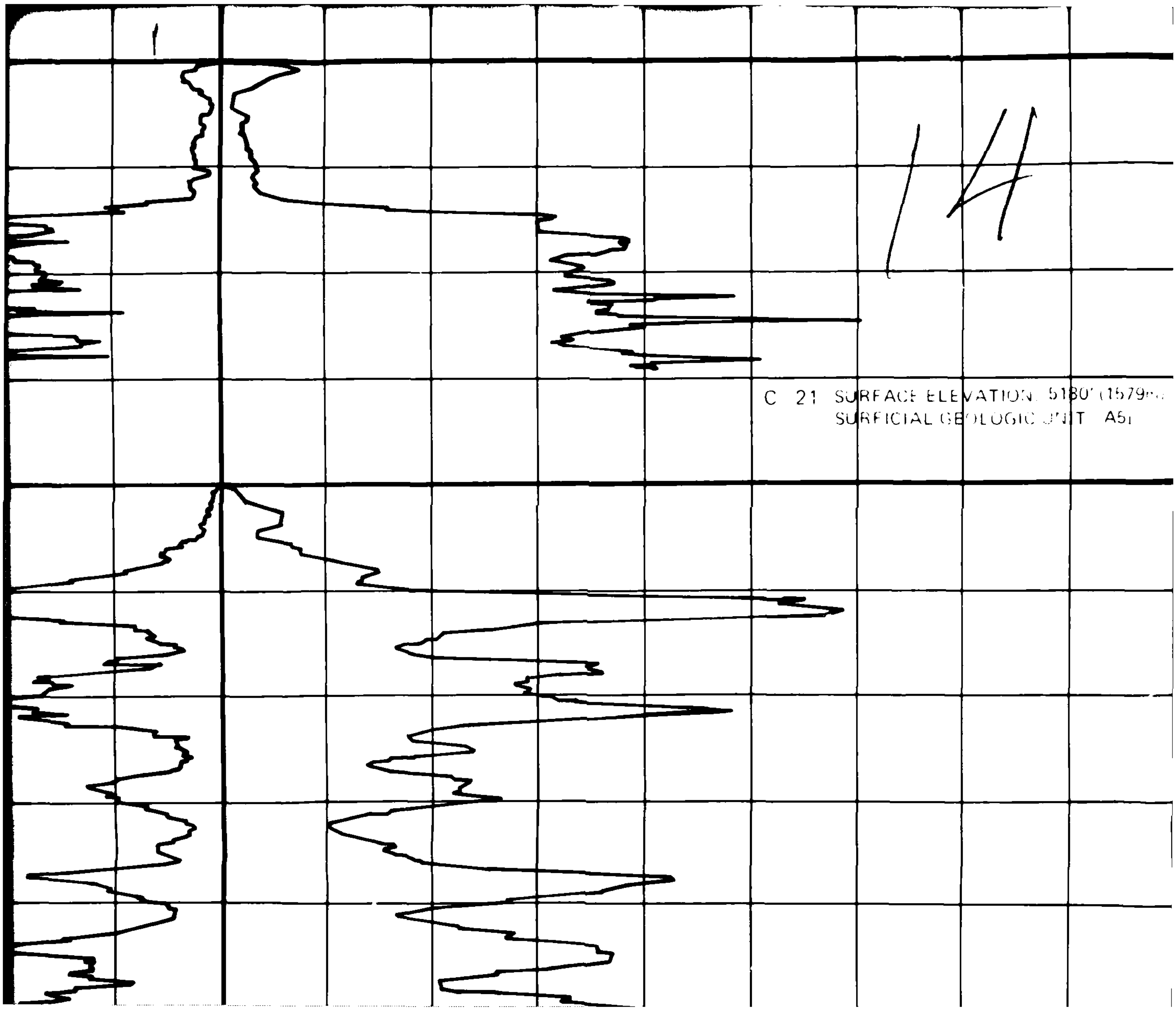
CE ELEVATION: 5230' (1594m)
AL GEOLOGIC UNIT: A5

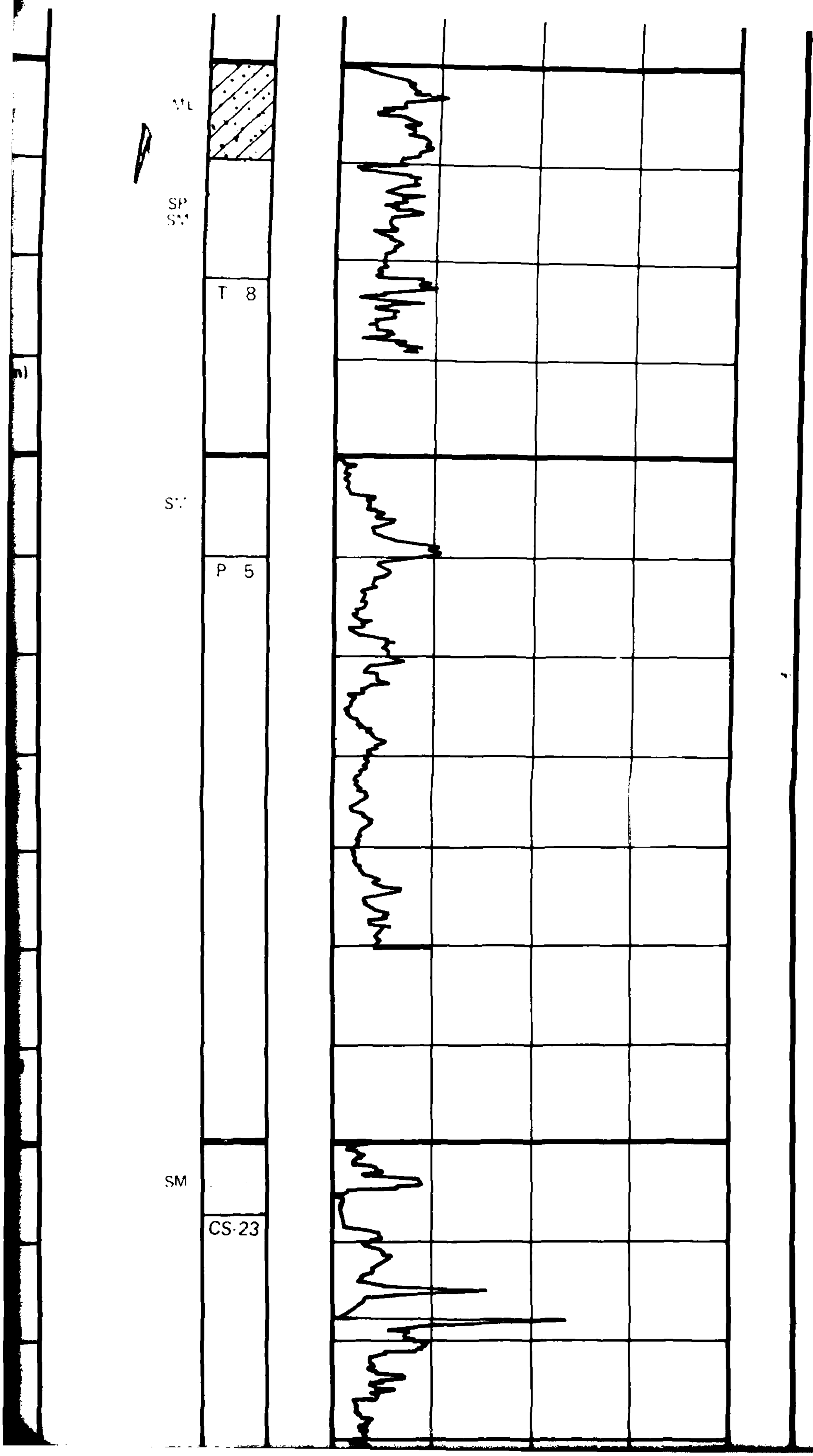


20
25
30
10
35
0
0
1
5
2
3
10
4
15
5
6
20
7

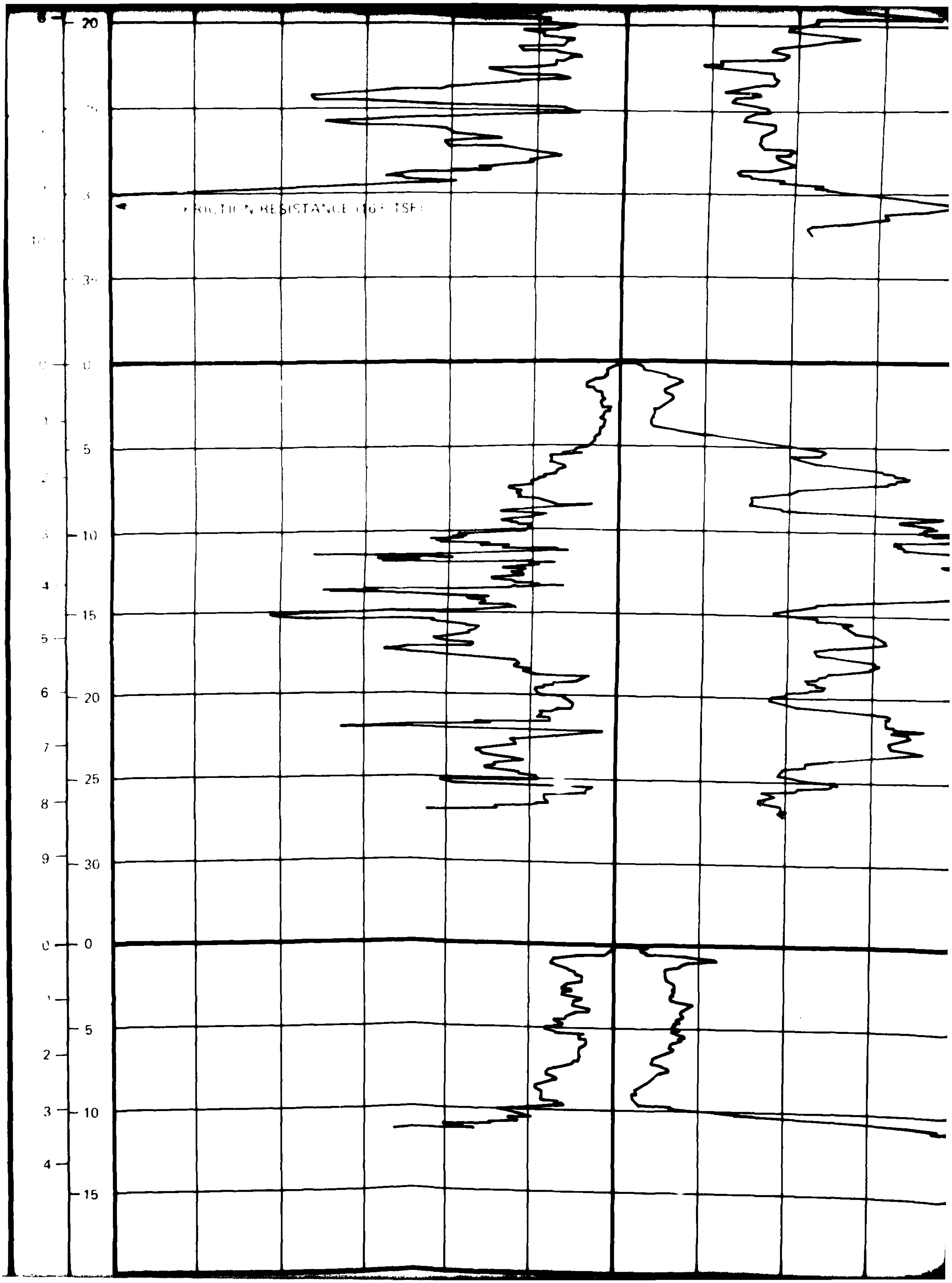

12
SM
T 3
C 9 SURFACE ELEVATION 4915' (1498m)
SURFICIAL GEOLOGIC UNIT A5
CS 10

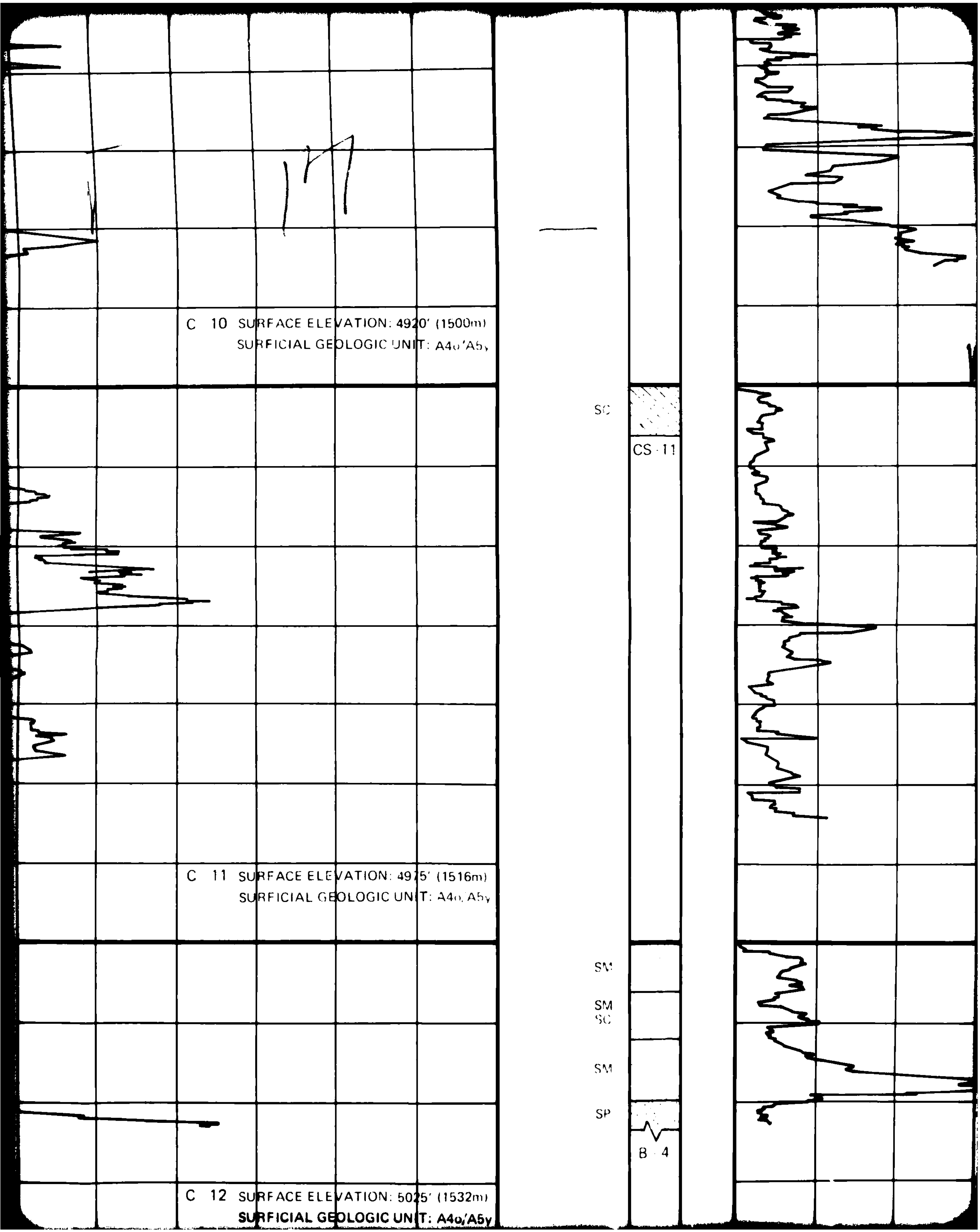

0 1 2 3 4
0 5 10 15
0 1 2 3 4 5 6 7 8 9
0 5 10 15 20 25 30
0 1 2 3 4
0 5 10

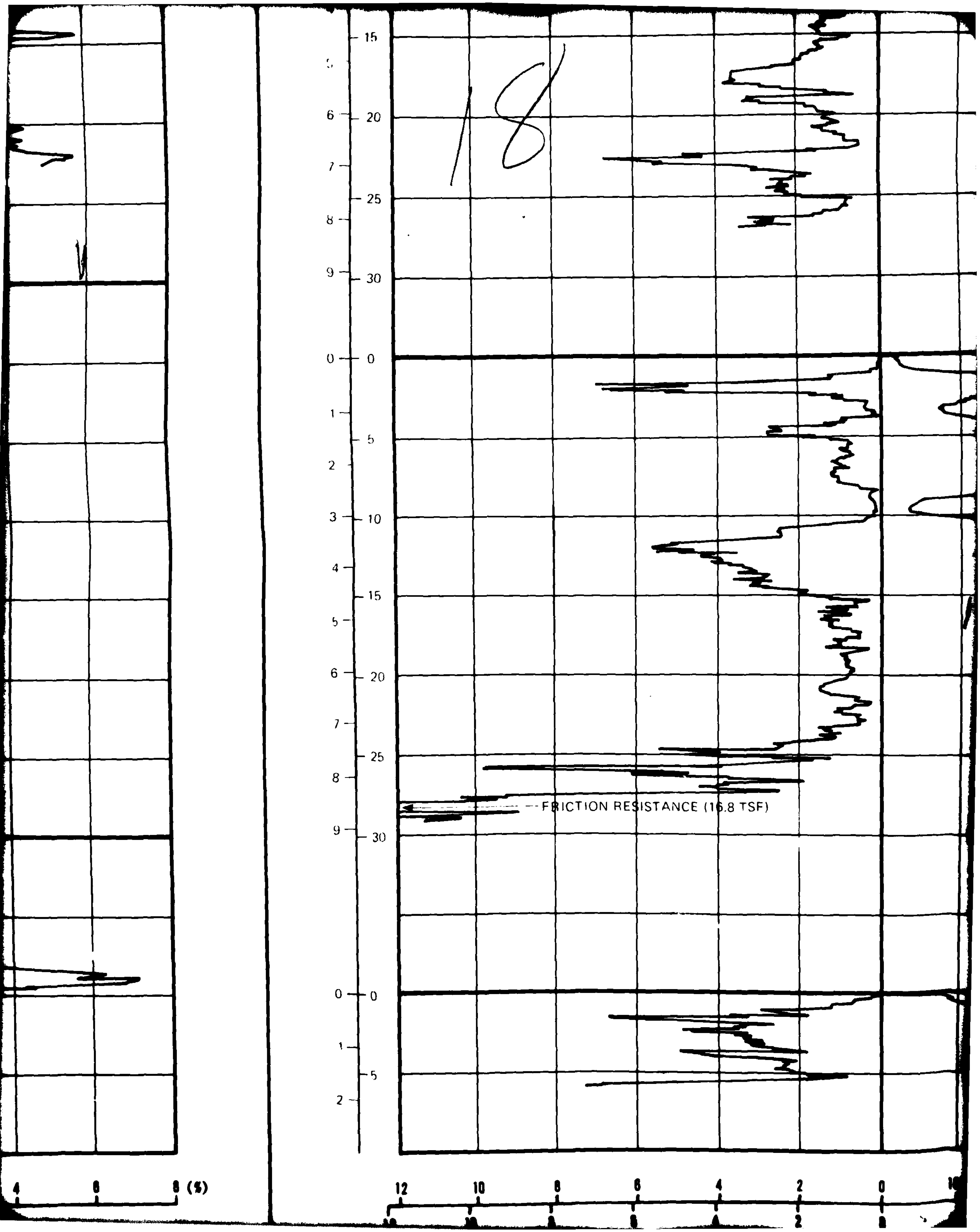

14
C 21 SURFACE ELEVATION 5180' (1579m)
SURFICIAL GEOLOGIC UNIT A5

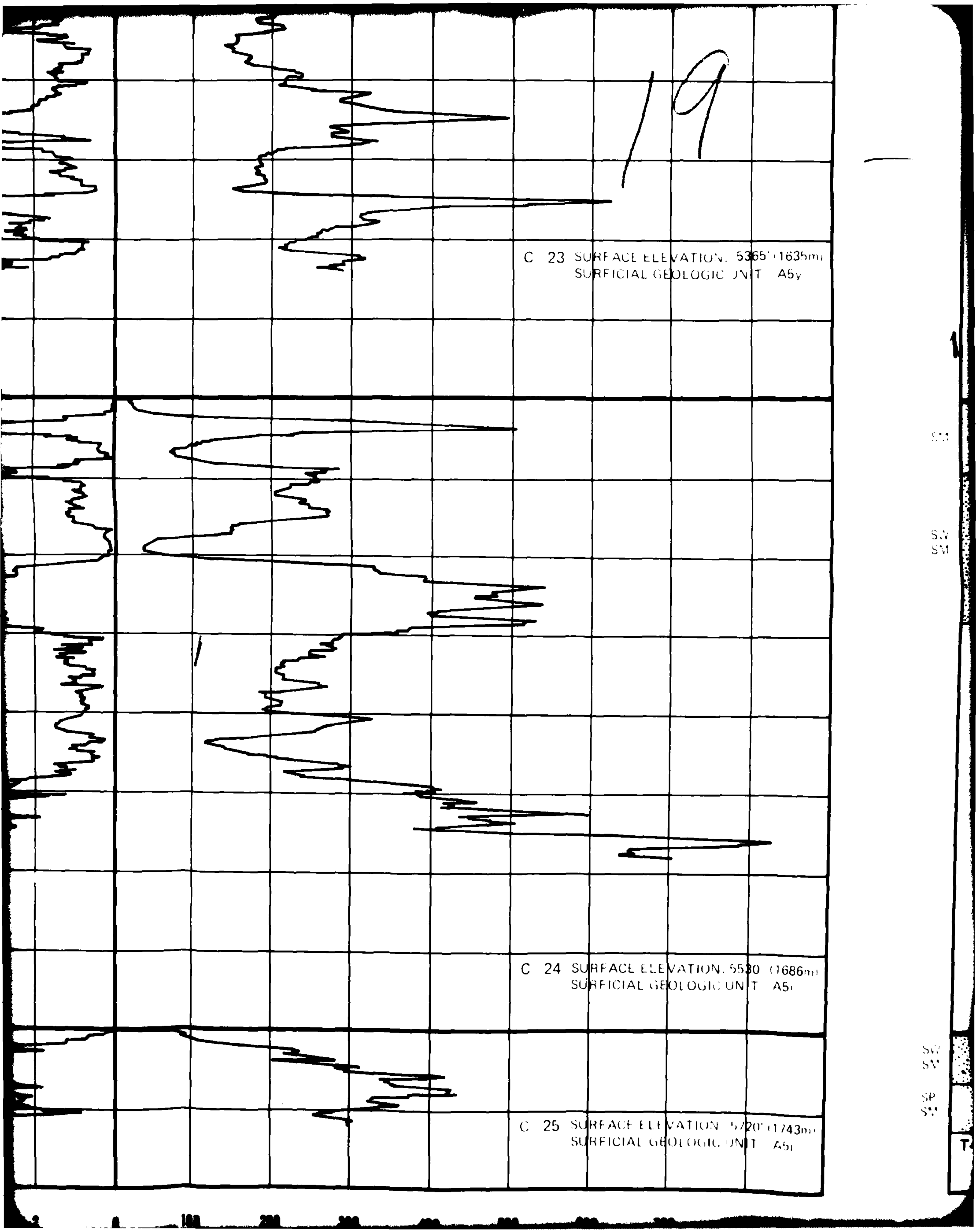


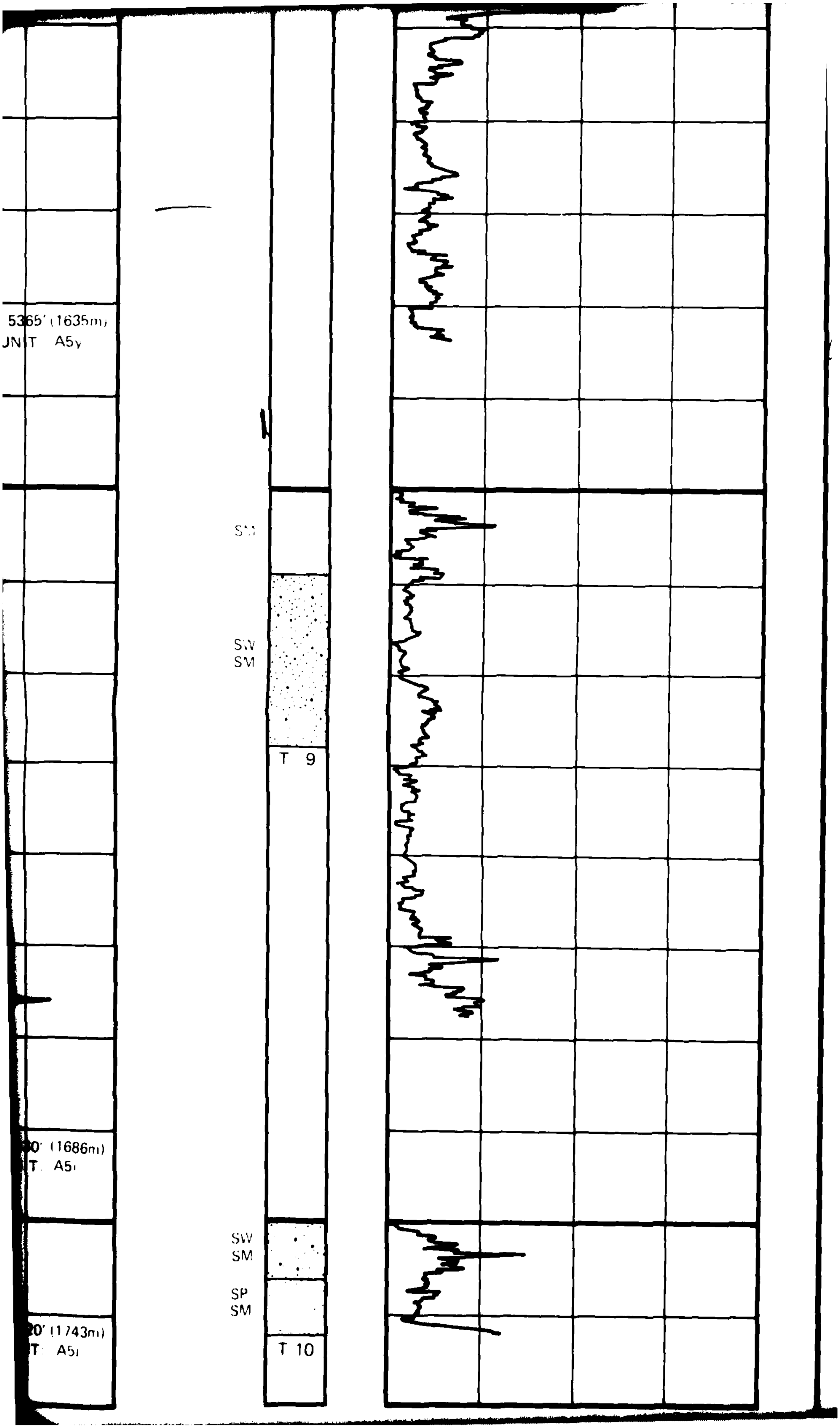
15


FRICTION RESISTANCE (10 = TSF)
20
5
10
15
20
25
30
0
5
10
15

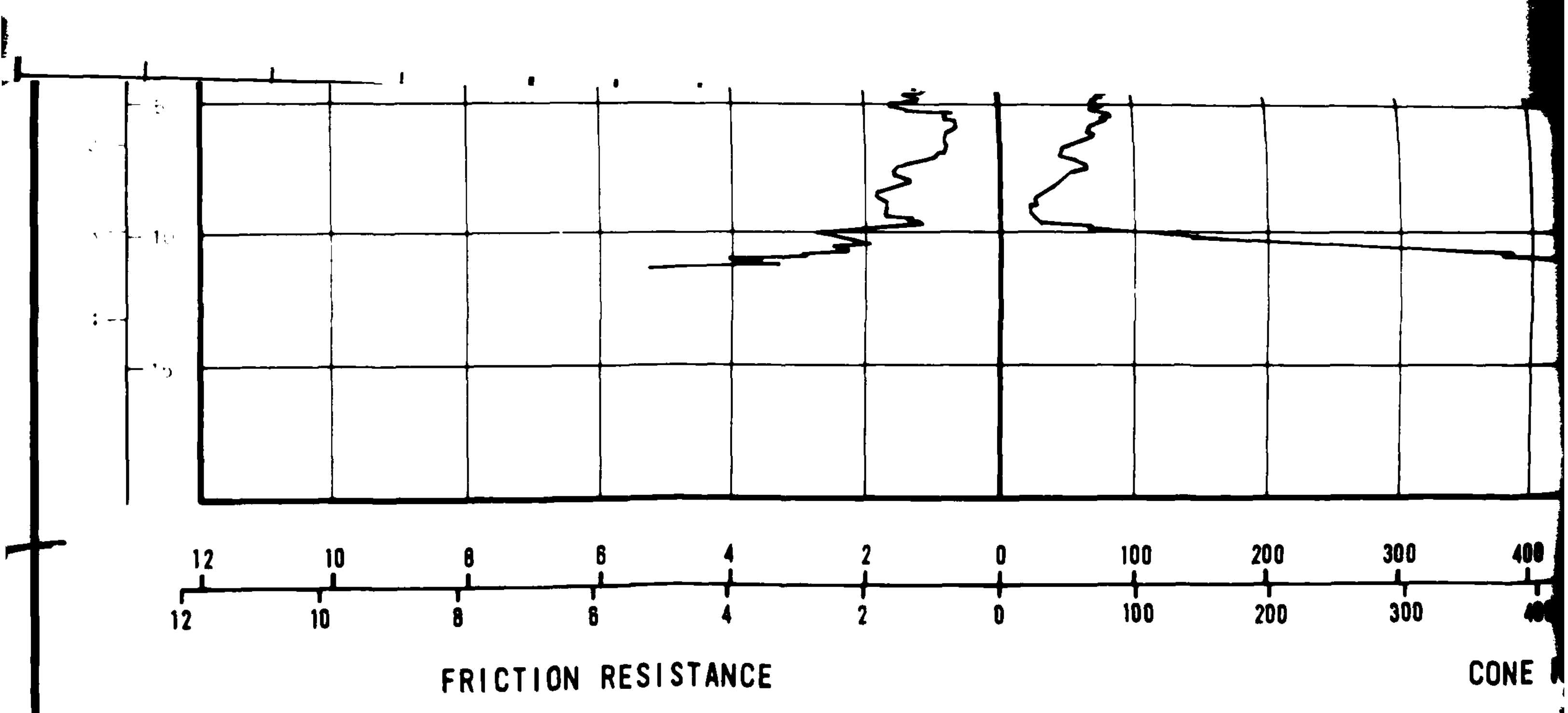

C 10 SURFACE ELEVATION: 4920' (1500m)
SURFICIAL GEOLOGIC UNIT: A4o/A5y
SC
CS-11
C 11 SURFACE ELEVATION: 4975' (1516m)
SURFICIAL GEOLOGIC UNIT: A4o/A5y
SM
SM
SC
SM
SP
B-4
C 12 SURFACE ELEVATION: 5025' (1532m)
SURFICIAL GEOLOGIC UNIT: A4o/A5y


18
FRICTION RESISTANCE (16.8 TSF)
4 6 8 (%)
12 10 8 6 4 2 0

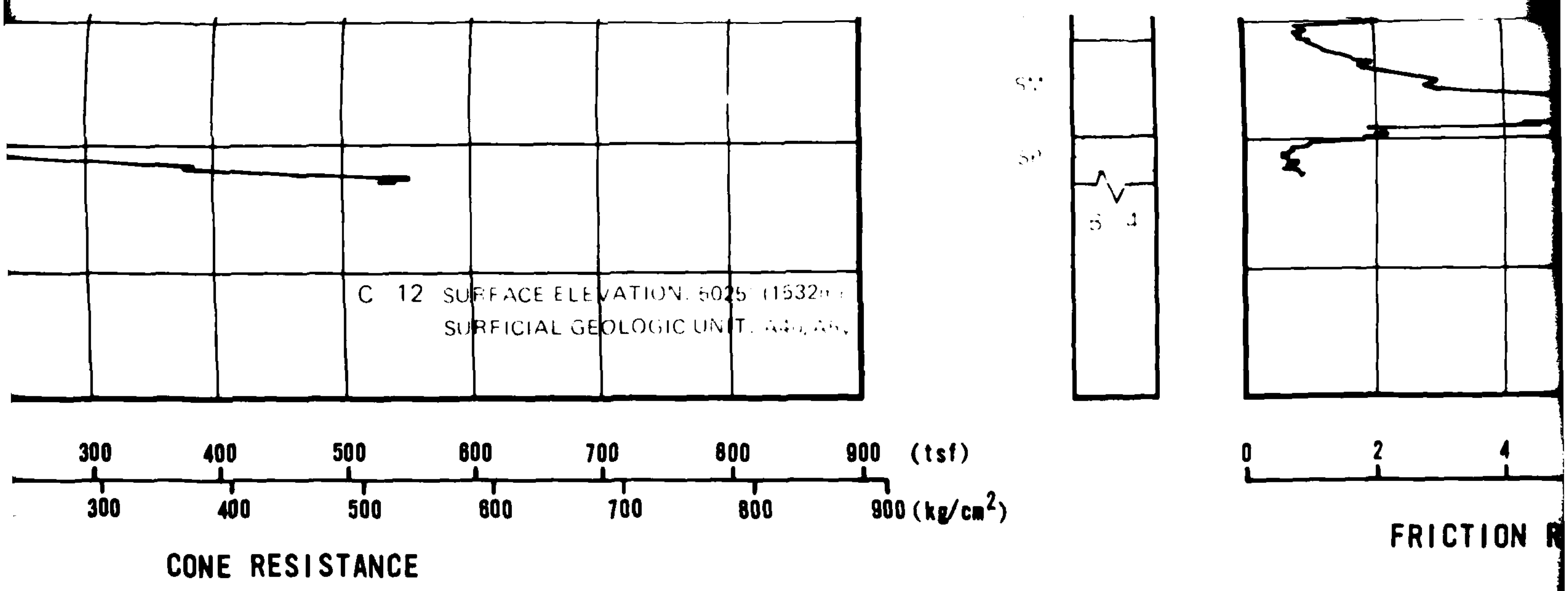

19
C 23 SURFACE ELEVATION: 5365' (1635m)
SURFICIAL GEOLOGIC UNIT A5y
C 24 SURFACE ELEVATION: 5530 (1686m)
SURFICIAL GEOLOGIC UNIT A5i
C 25 SURFACE ELEVATION 5720' (1743m)
SURFICIAL GEOLOGIC UNIT A5i
SM
SW
SM
SW
SM
SP
SM
T
0
100
200
300



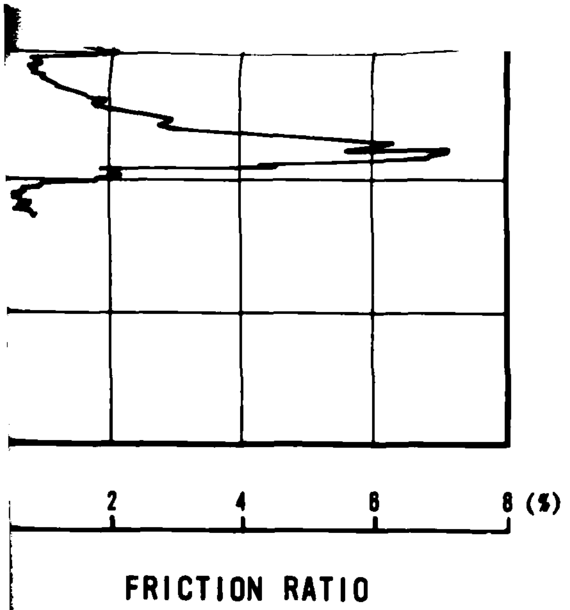
5365' (1635m)
UNIT A5y
SM
SW
SM
T 9
(1686m)
A5
SW
SM
SP
SM
(1743m)
A5
T 10



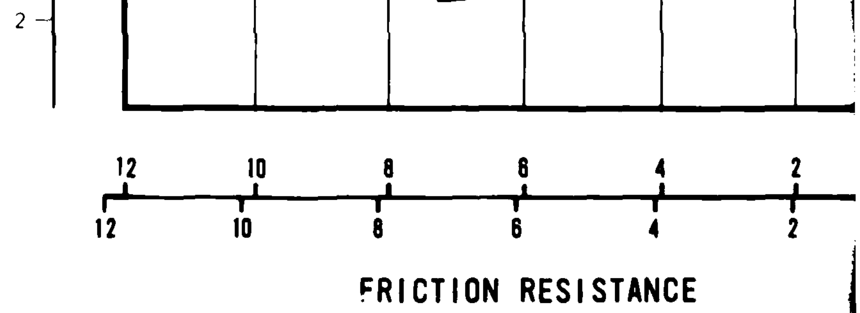
51


C 12 SURFACE ELEVATION: 5025' (1532m)
SURFICIAL GEOLOGIC UNIT:
300 400 500 600 700 800 900 (tsf)
300 400 500 600 700 800 900 (kg/cm²)
CONE RESISTANCE
0 2 4
FRICTION R

22



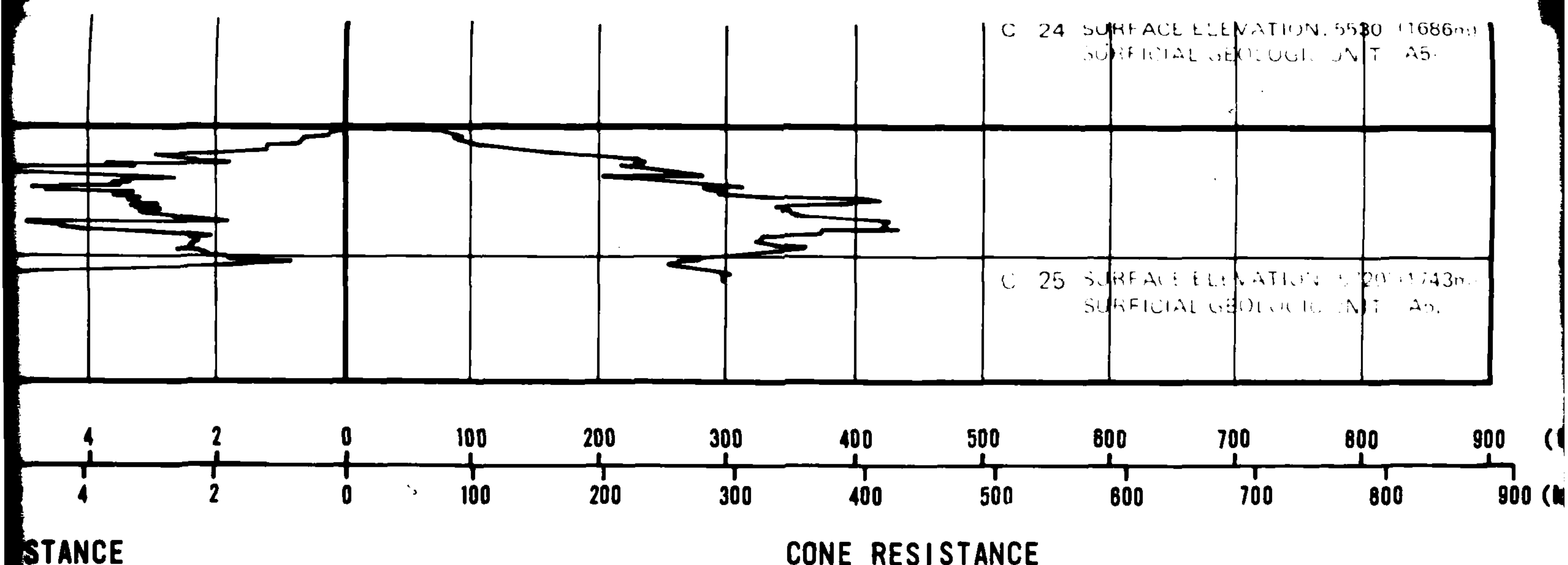
2 4 6 8 (%)
FRICTION RATIO



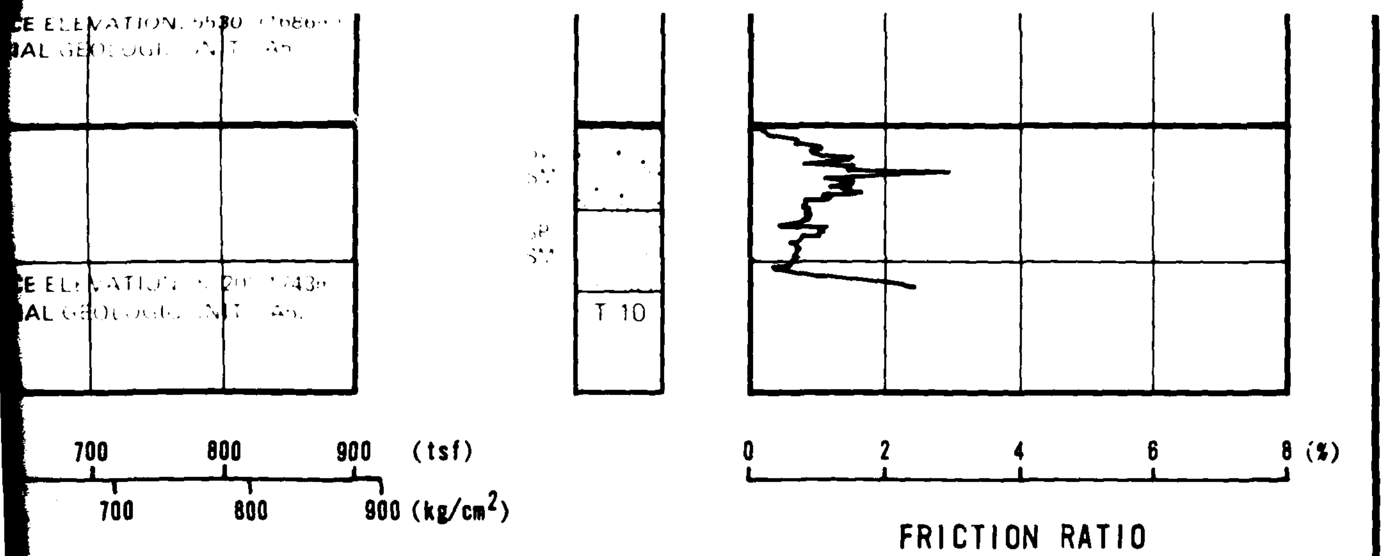
0
1
2
0
.5
12 10 8 6 4 2
12 10 8 6 4 2
FRICTION RESISTANCE

23

1



C 24 SURFACE ELEVATION: 5530 (1686m)
SURFICIAL GEOLOGIC UNIT A5
C 25 SURFACE ELEVATION (1743m)
SURFICIAL GEOLOGIC UNIT A5
4 2 0 100 200 300 400 500 600 700 800 900
4 2 0 100 200 300 400 500 600 700 800 900
STANCE
CONE RESISTANCE

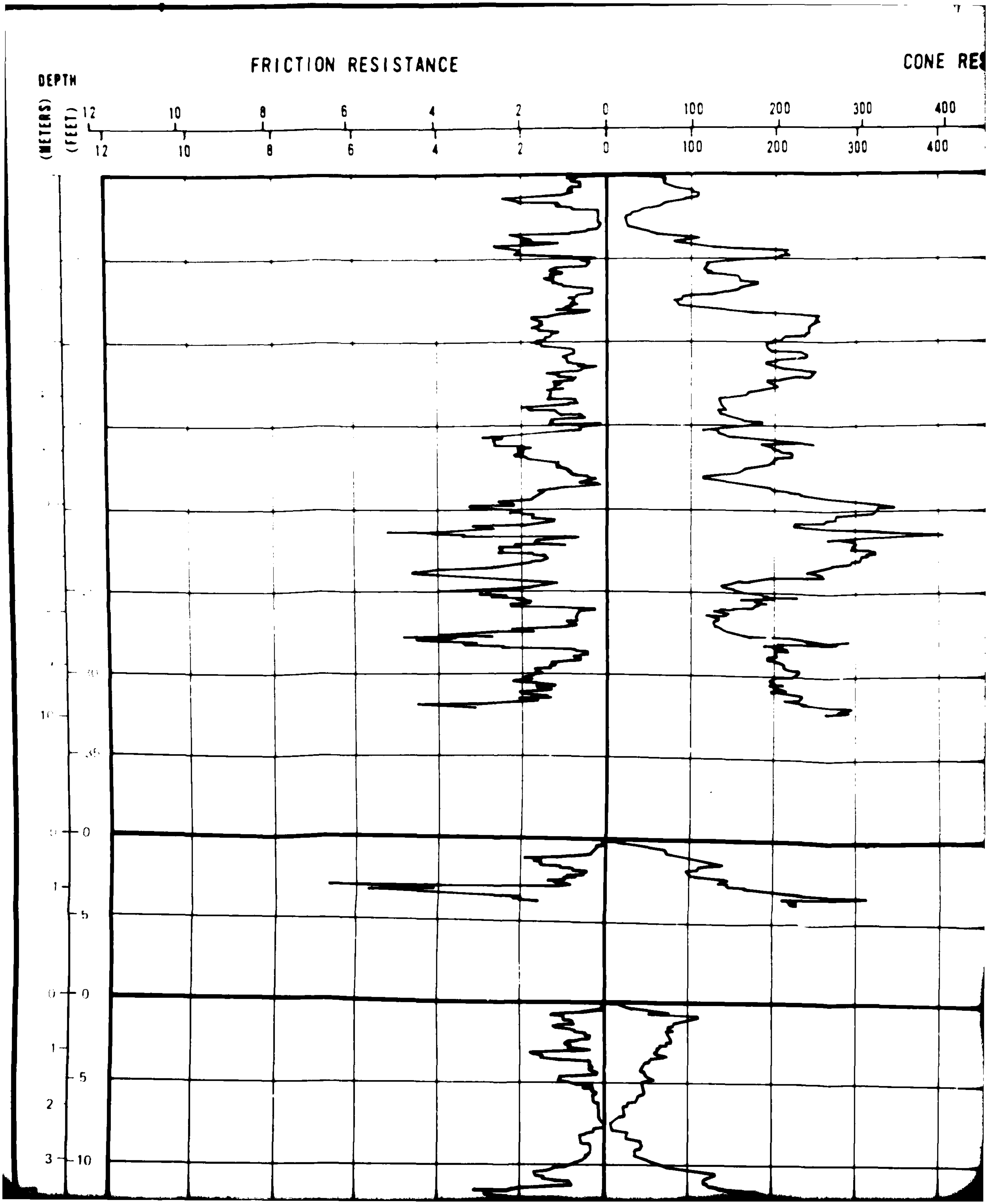


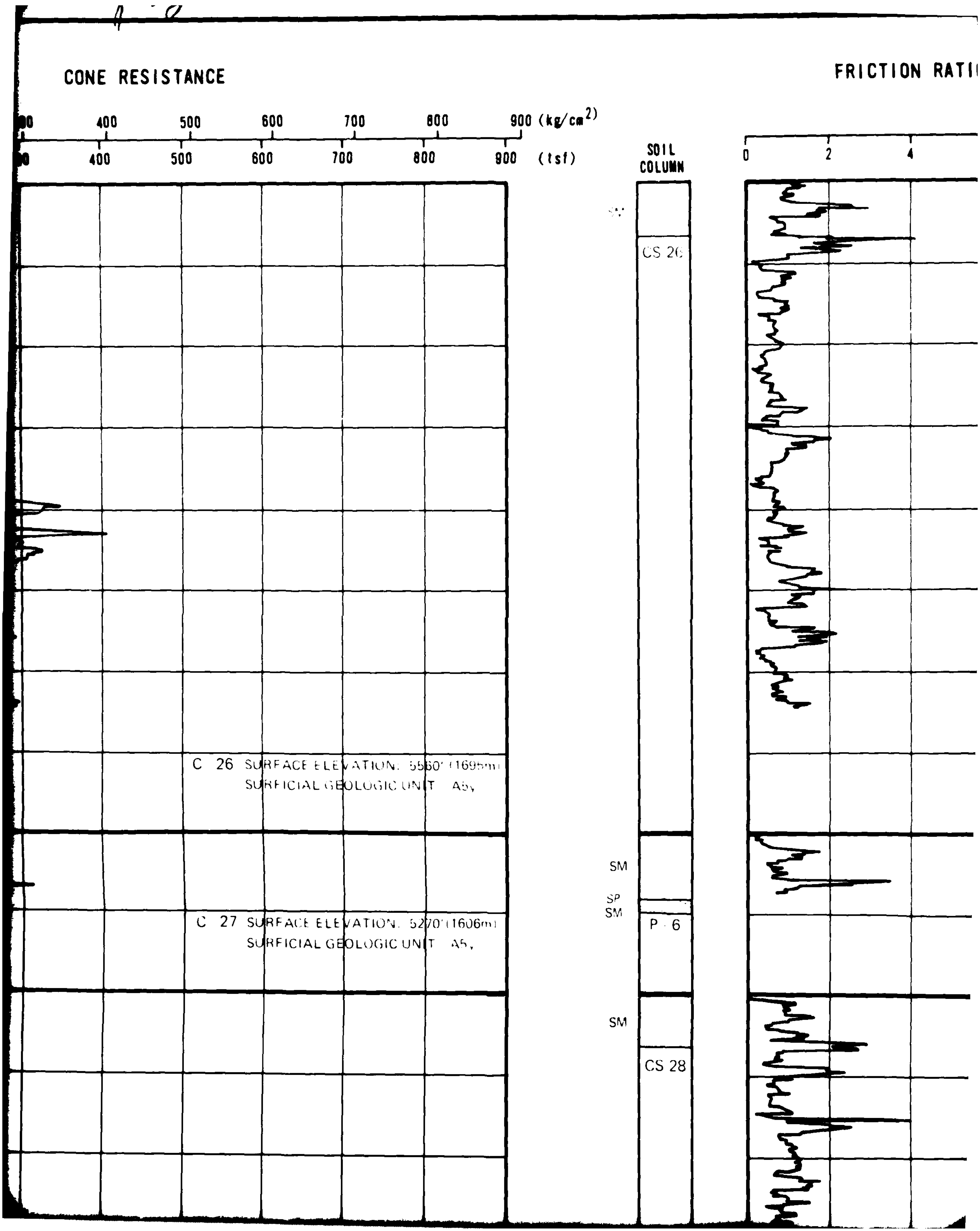
25

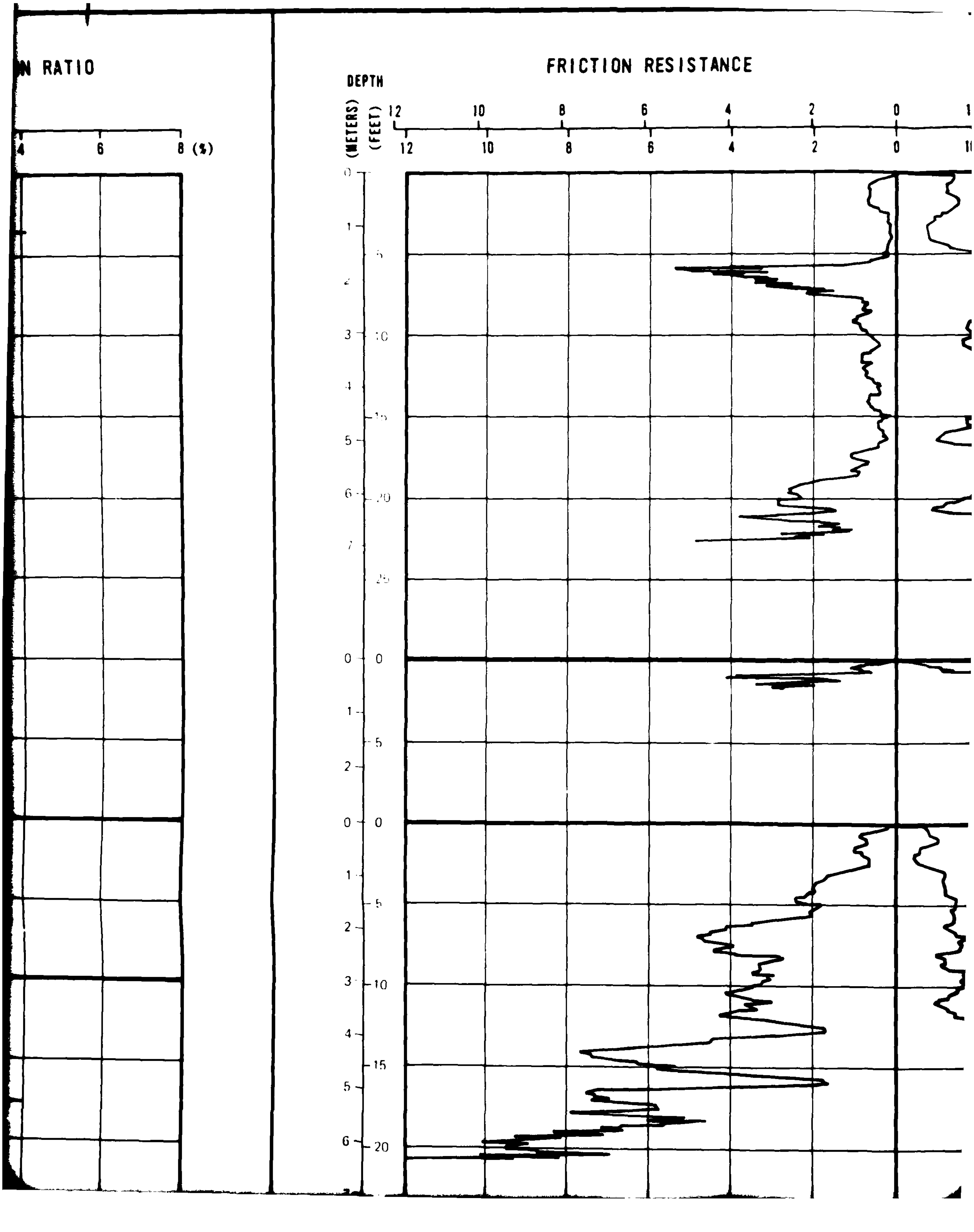
CONE PENETROMETER TEST RESULTS
WAH WAH VALLEY, UTAH

MX SITING INVESTIGATION DEPARTMENT OF THE AIR FORCE - BMO	DRAWING II-10-1 1 OF 4

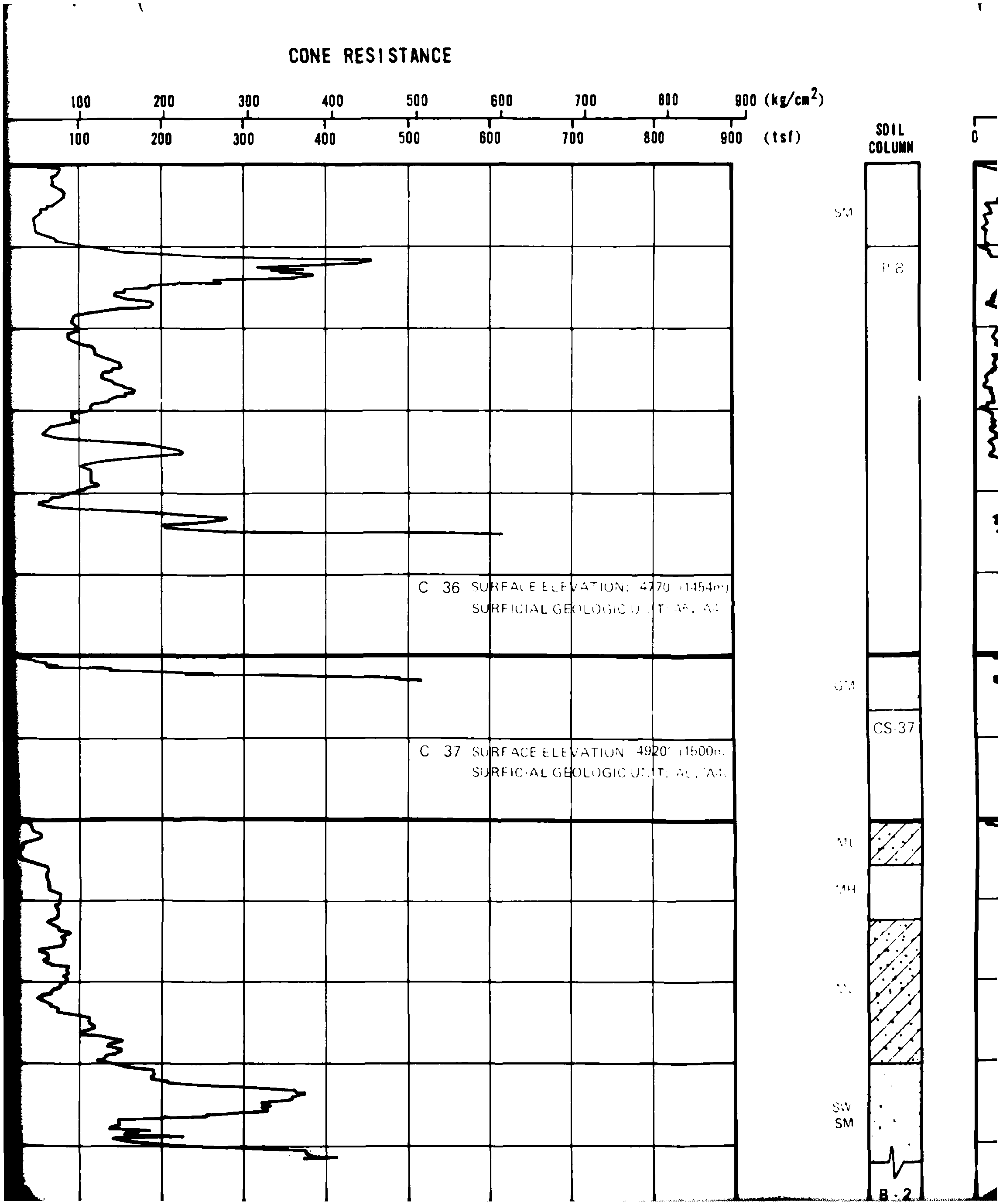
FUGRO NATIONAL, INC.

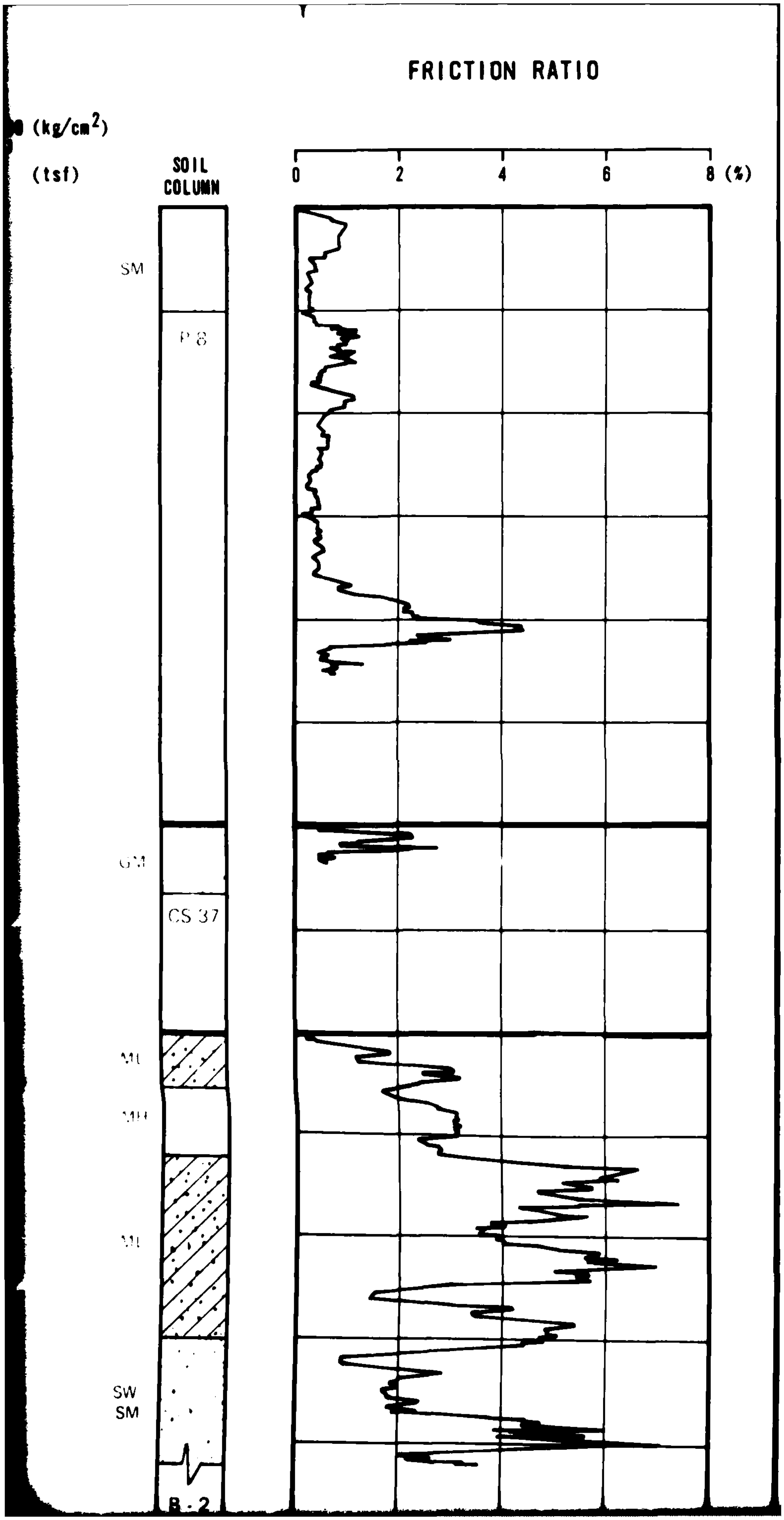

FRICTION RESISTANCE
CONE RES
DEPTH
(METERS)
(FEET)
12 10 8 6 4 2 0 100 200 300 400
12 10 8 6 4 2 0 100 200 300 400
10
0
1
5
0
1
5
2
3
10

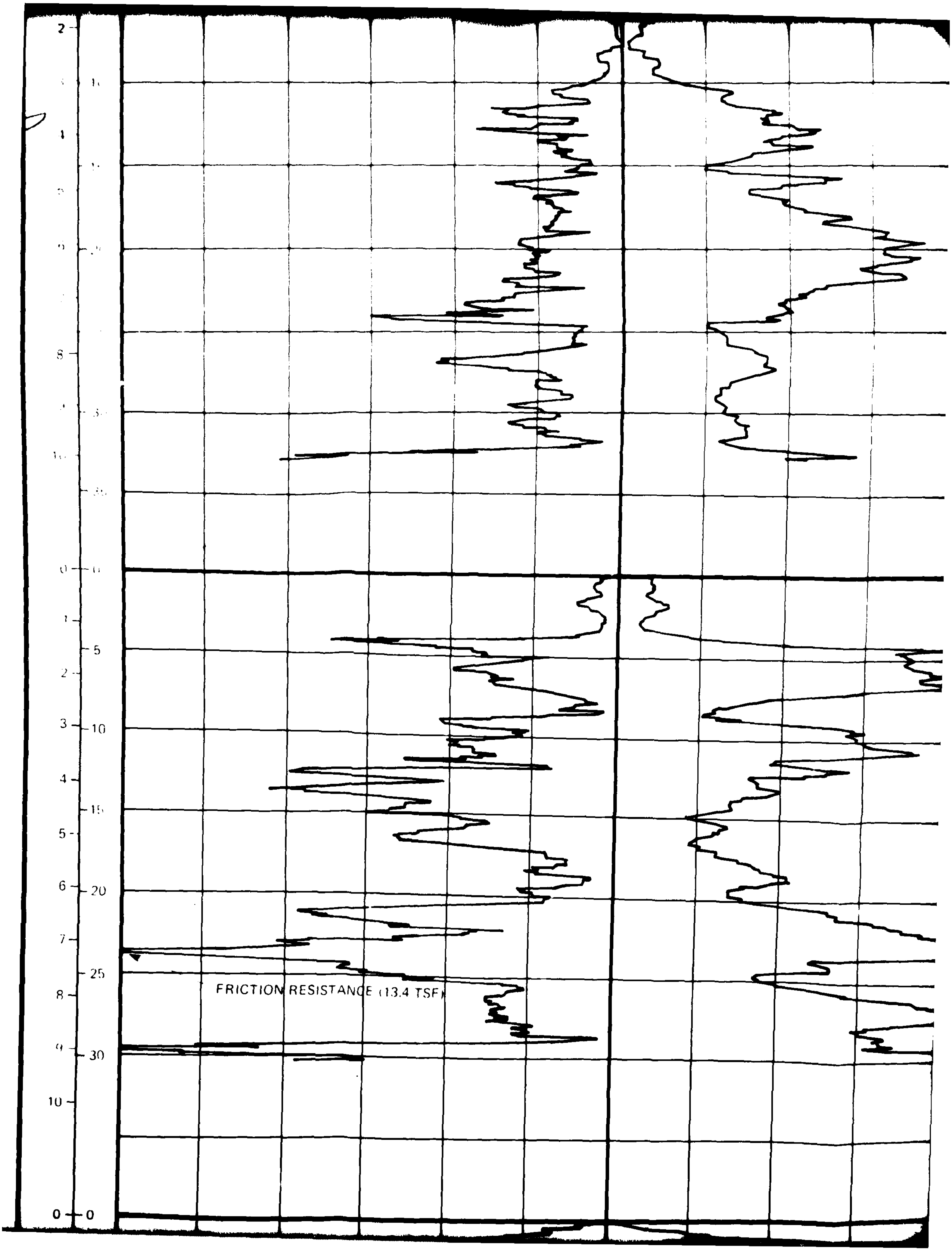

CONE RESISTANCE
FRICTION RATI
400 500 600 700 800 900 (kg/cm2)
400 500 600 700 800 900 (tsf)
SOIL COLUMN
0 2 4
CS 26
C 26 SURFACE ELEVATION: 5560' (1695m)
SURFICIAL GEOLOGIC UNIT A5v
SM
SP
SM
P 6
C 27 SURFACE ELEVATION: 5270' (1606m)
SURFICIAL GEOLOGIC UNIT A5v
SM
CS 28



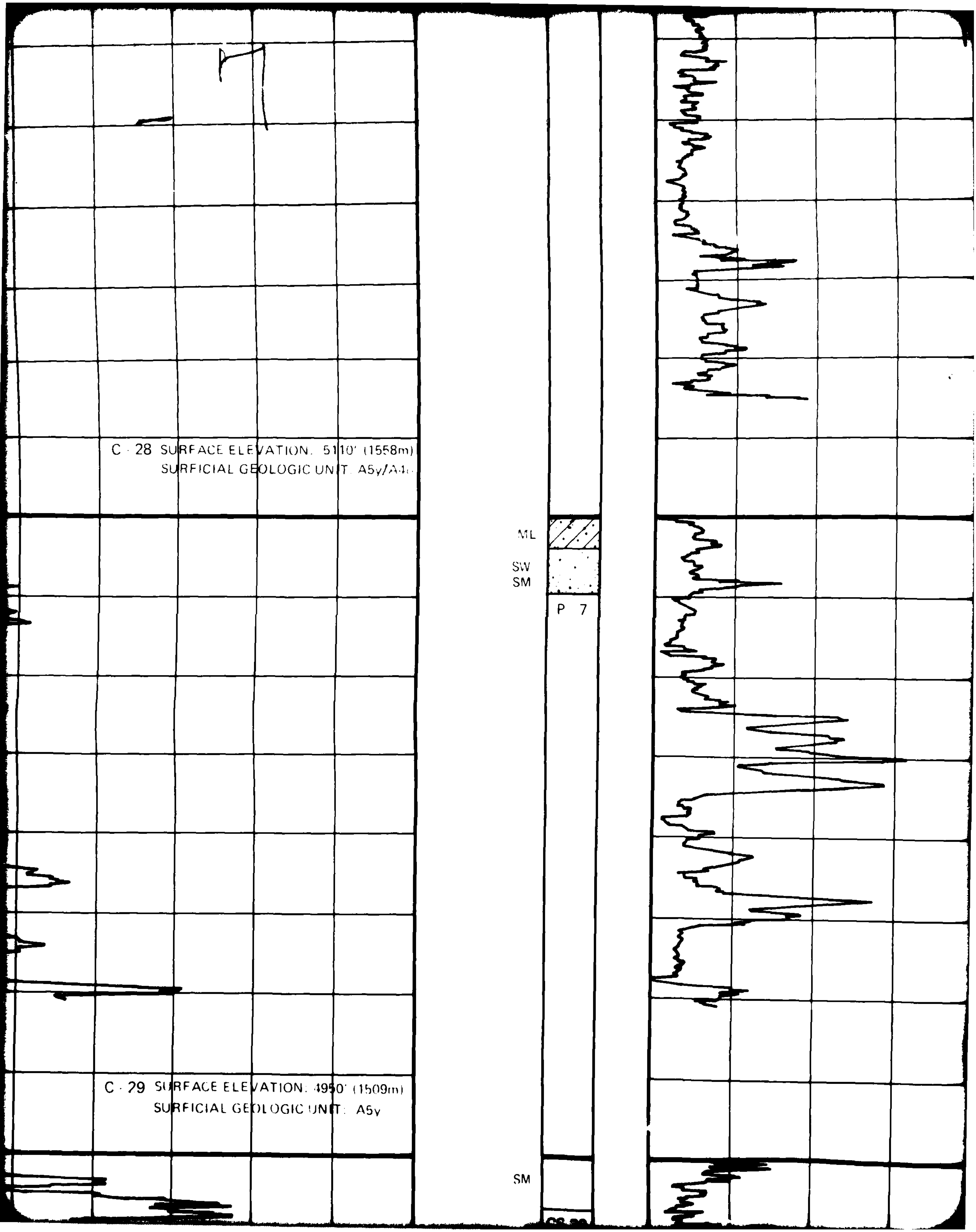
N RATIO
4
6
8 (%)
FRICTION RESISTANCE
DEPTH
(METERS)
(FEET)
12
10
8
6
4
2
0
0
1
2
3
4
5
6
7
5
10
15
20
25

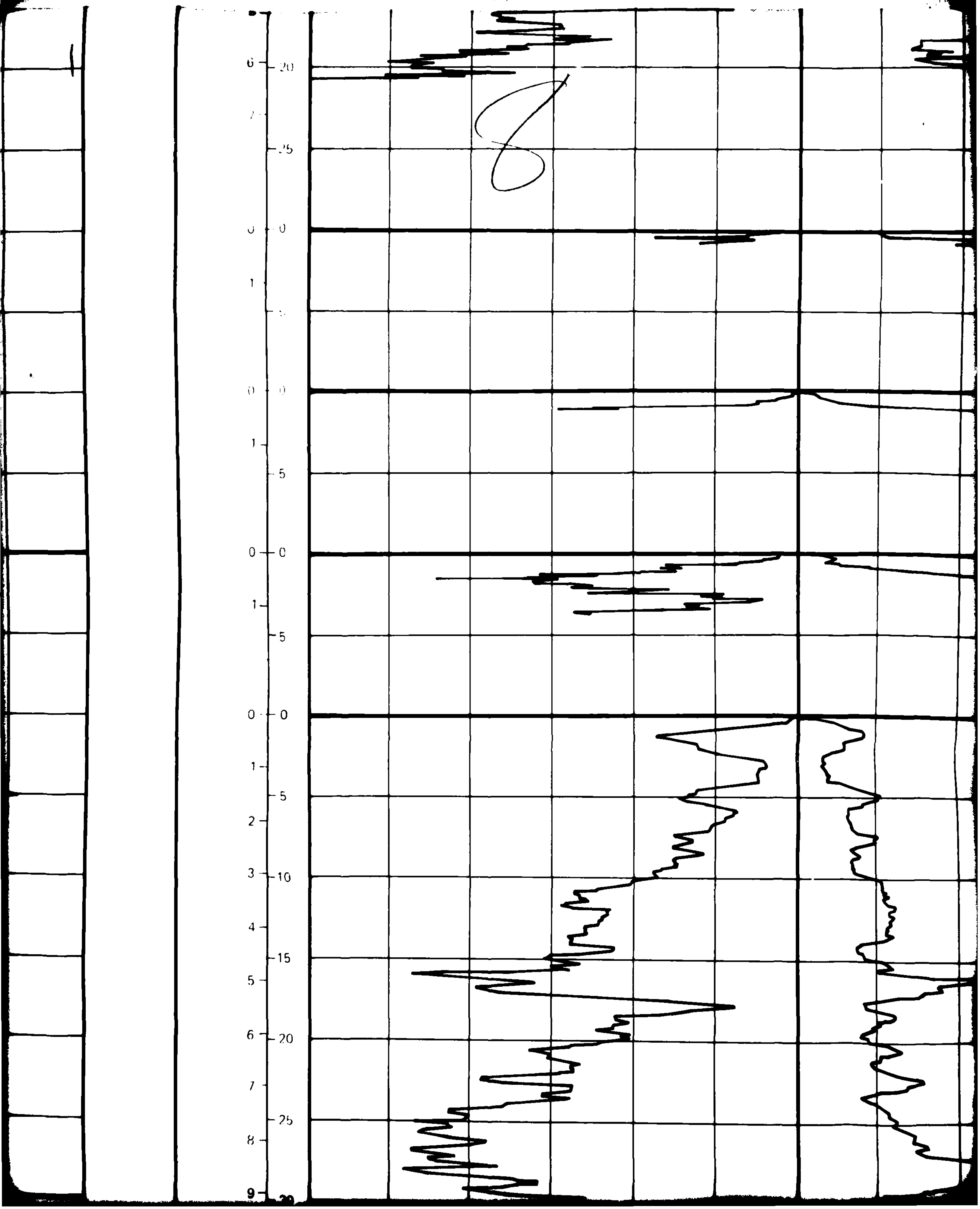

CONE RESISTANCE
100 200 300 400 500 600 700 800 900 (kg/cm2)
100 200 300 400 500 600 700 800 900 (tsf)
SOIL COLUMN
0
SM
GM
CS-37
SW
SM
B-2
C 36 SURFACE ELEVATION: 4770' (1454m)
SURFICIAL GEOLOGIC UNIT:
C 37 SURFACE ELEVATION: 4920' (1500m)
SURFICIAL GEOLOGIC UNIT:

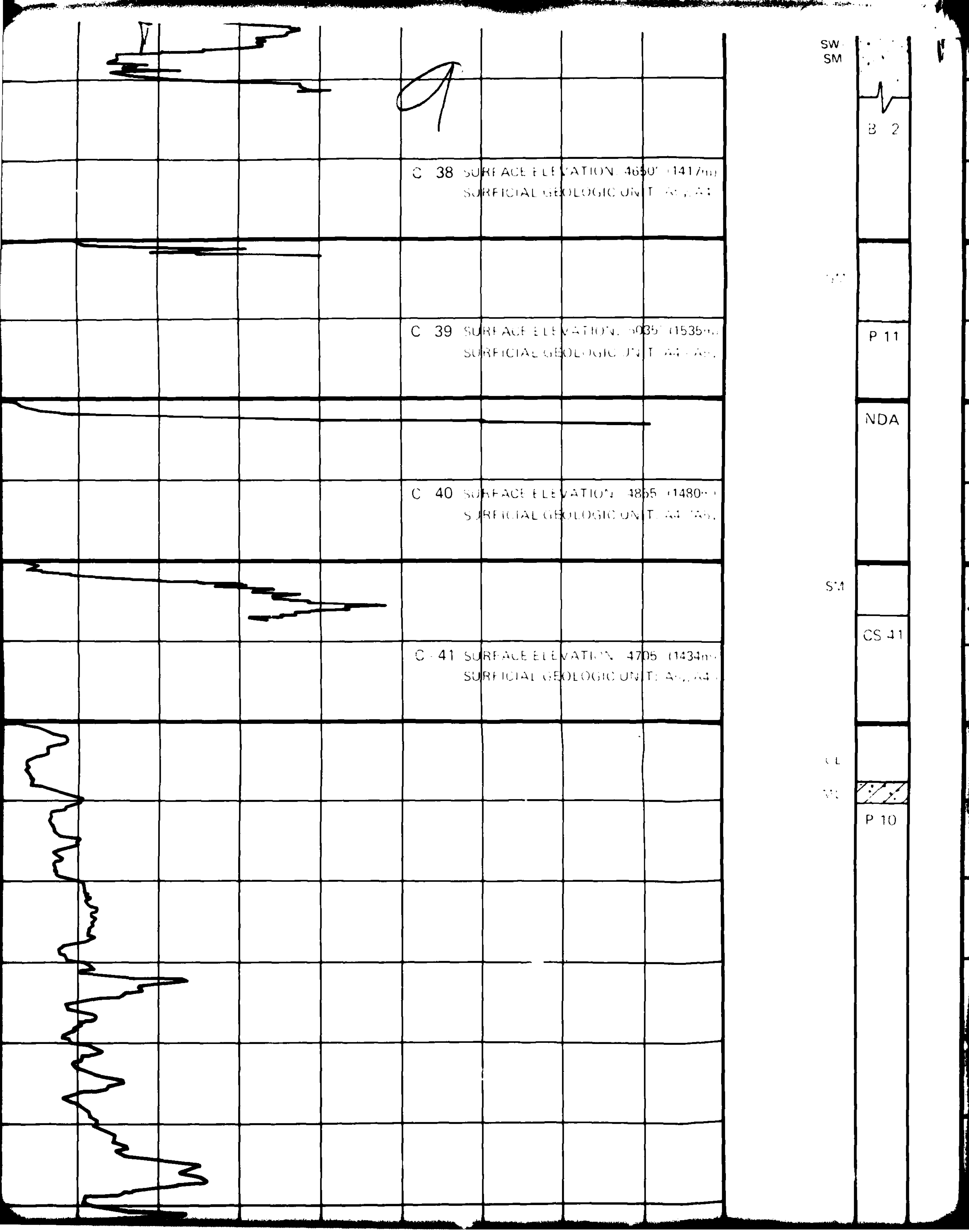

FRICTION RATIO
(kg/cm2)
(tsf)
SOIL COLUMN
0
2
4
6
8 (%)
SM
P-8
GM
CS-37
ML
MH
ML
SW
SM
B-2



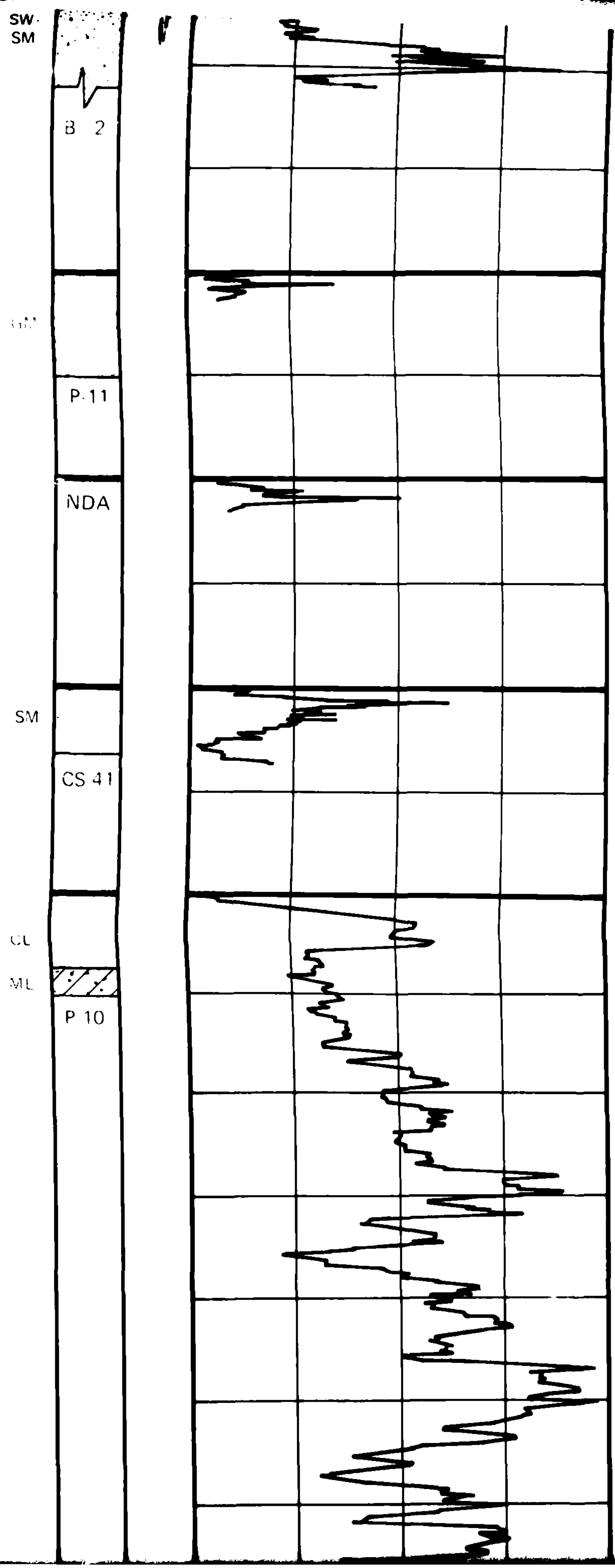
FRICTION RESISTANCE (13.4 TSF)


C - 28 SURFACE ELEVATION: 5110' (1558m)
SURFICIAL GEOLOGIC UNIT: A5y/A4
ML
SW
SM
P 7
C - 29 SURFACE ELEVATION: 4950' (1509m)
SURFICIAL GEOLOGIC UNIT: A5y
SM

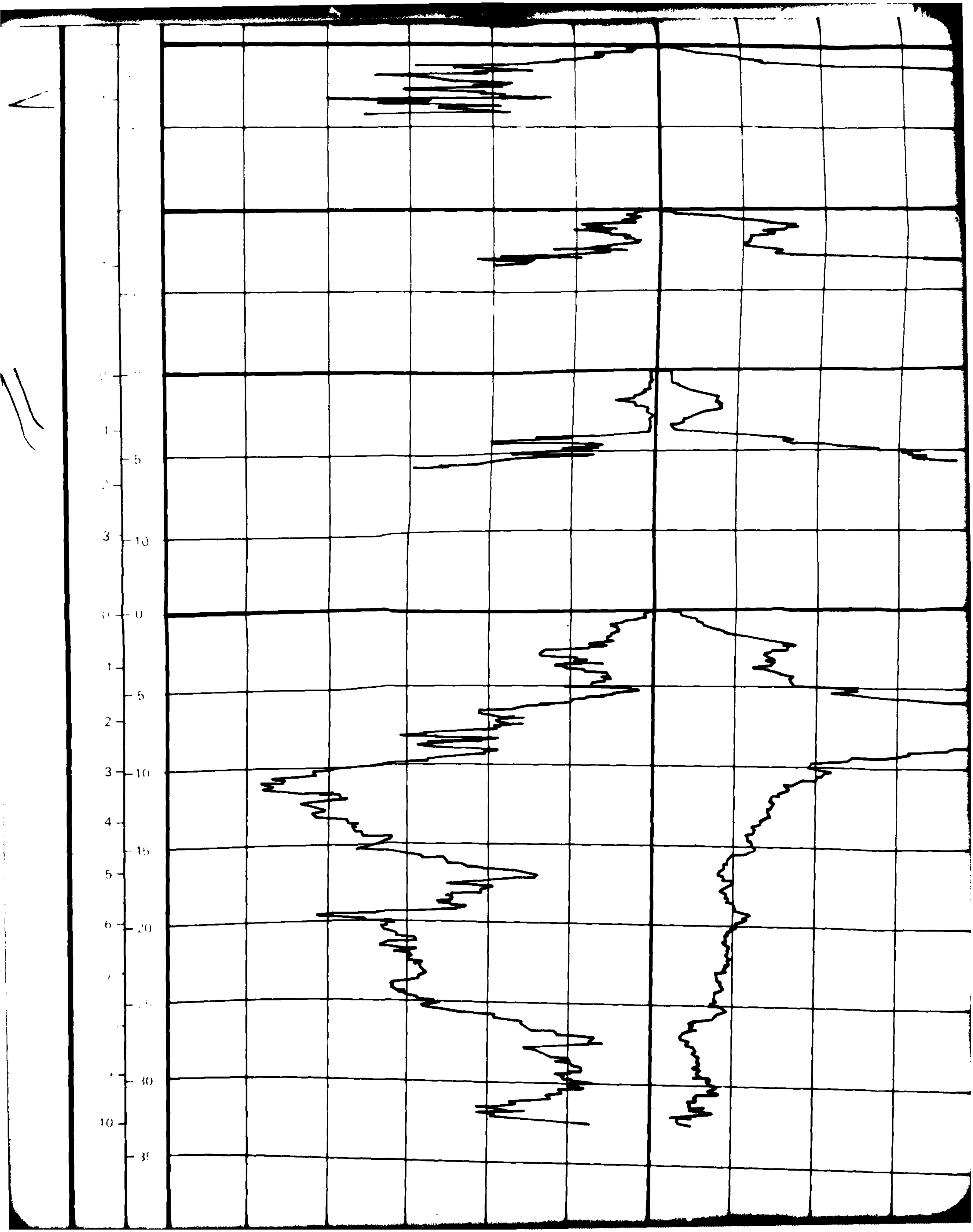


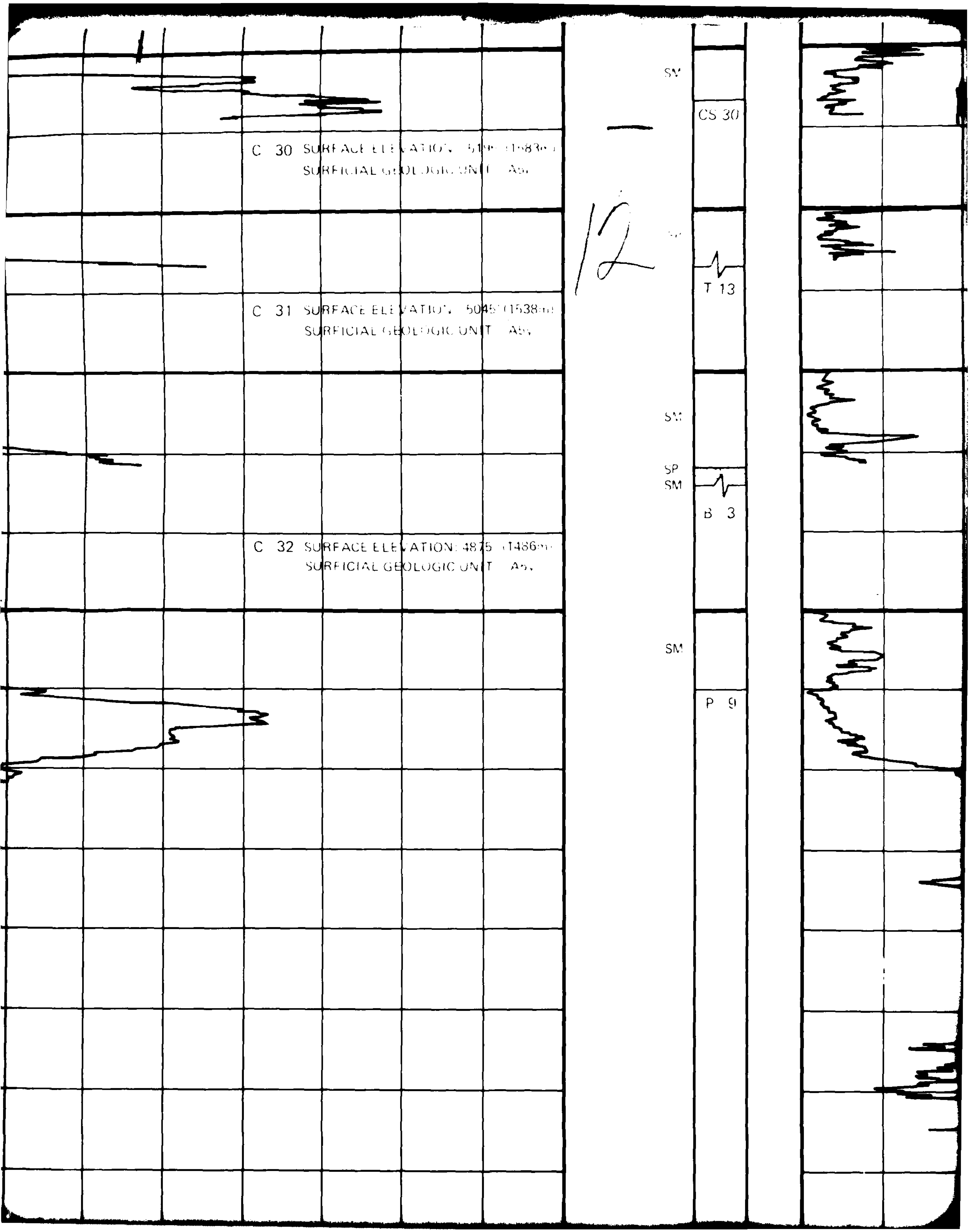


9
C 38 SURFACE ELEVATION: 4650' (1417m)
SURFICIAL GEOLOGIC UNIT:
C 39 SURFACE ELEVATION: 5035' (1535m)
SURFICIAL GEOLOGIC UNIT:
C 40 SURFACE ELEVATION: 4865 (1480m)
SURFICIAL GEOLOGIC UNIT:
C-41 SURFACE ELEVATION: 4705 (1434m)
SURFICIAL GEOLOGIC UNIT:
SW-SM
B-2
P-11
NDA
SM
CS-41
CL
P-10

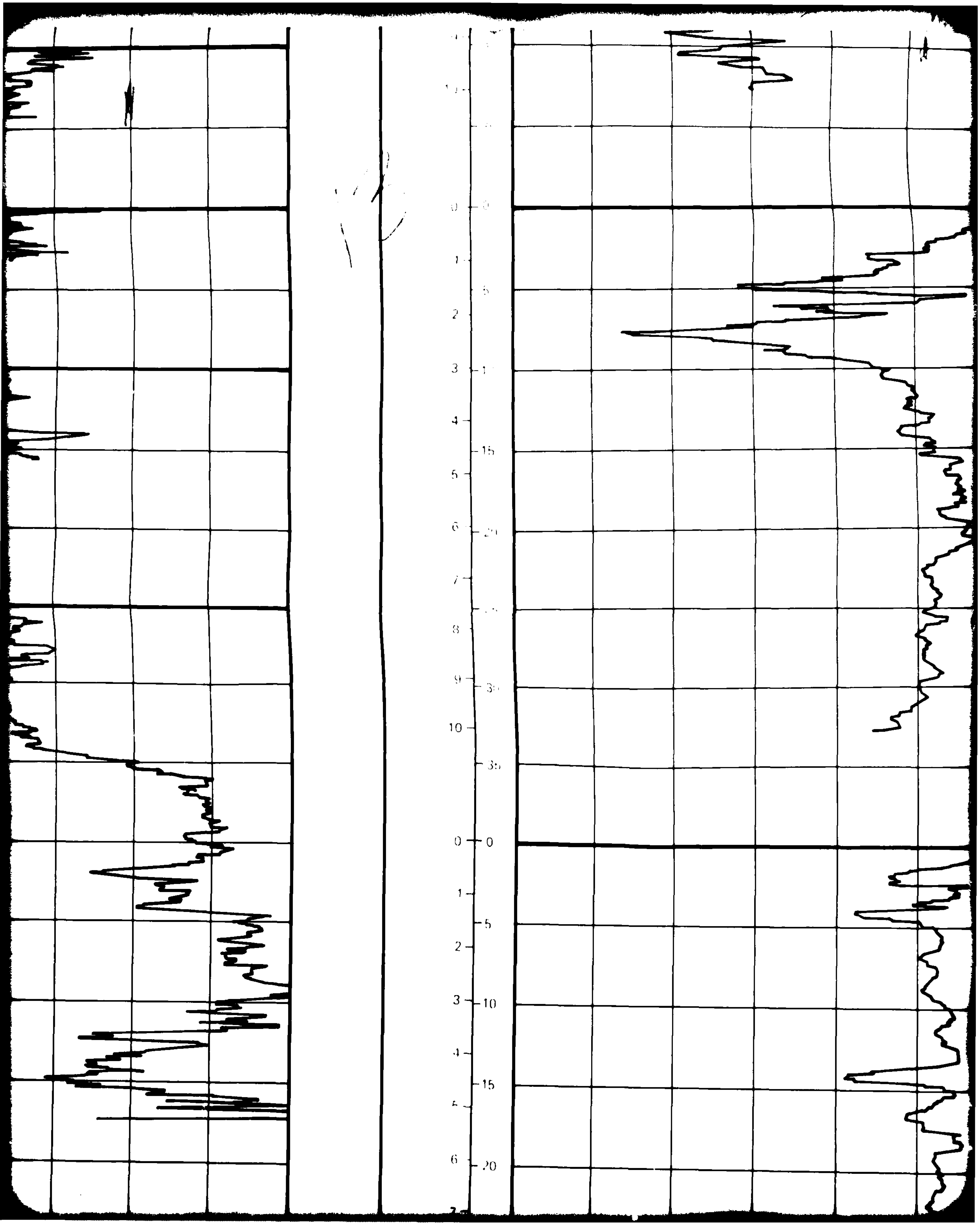


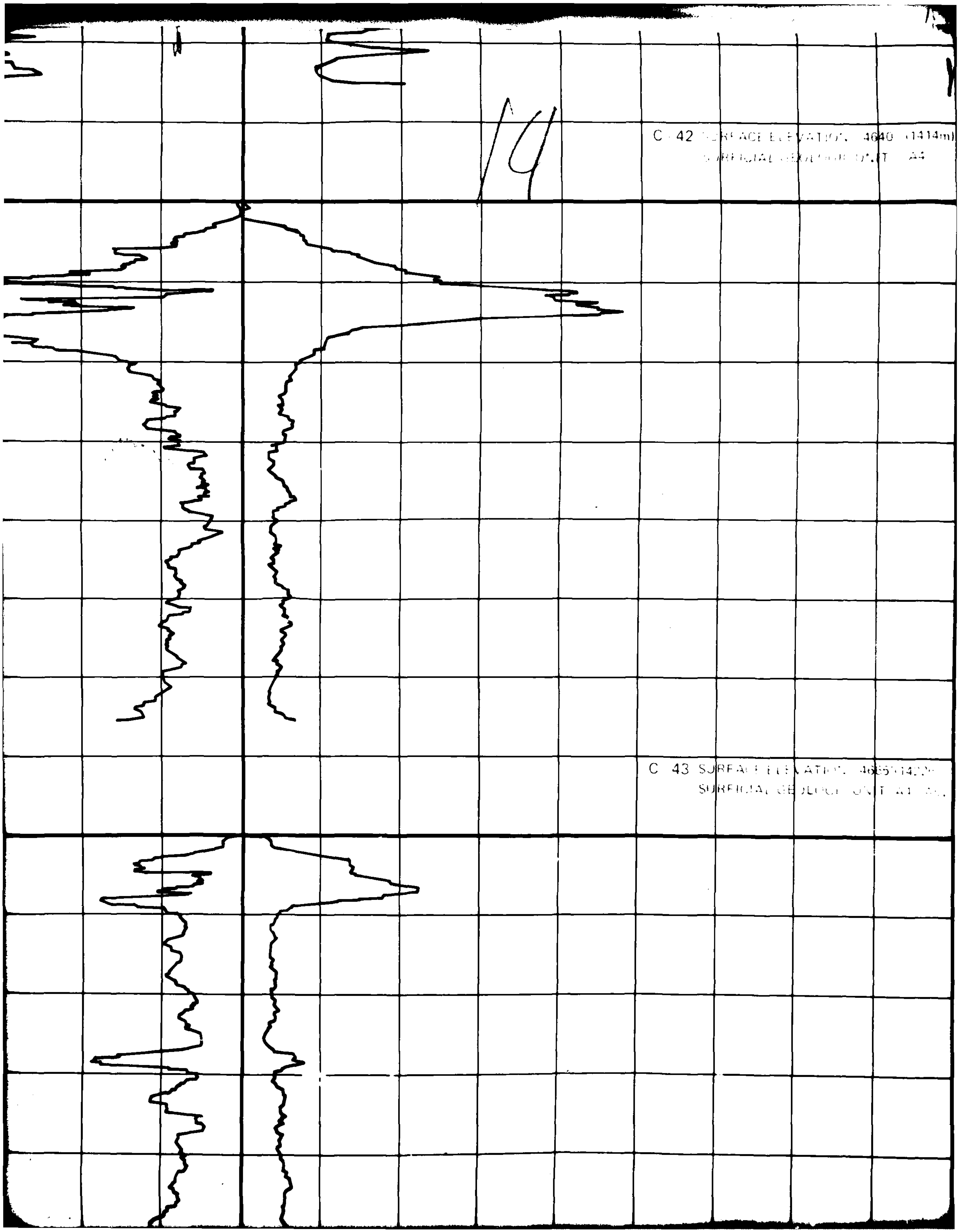
10

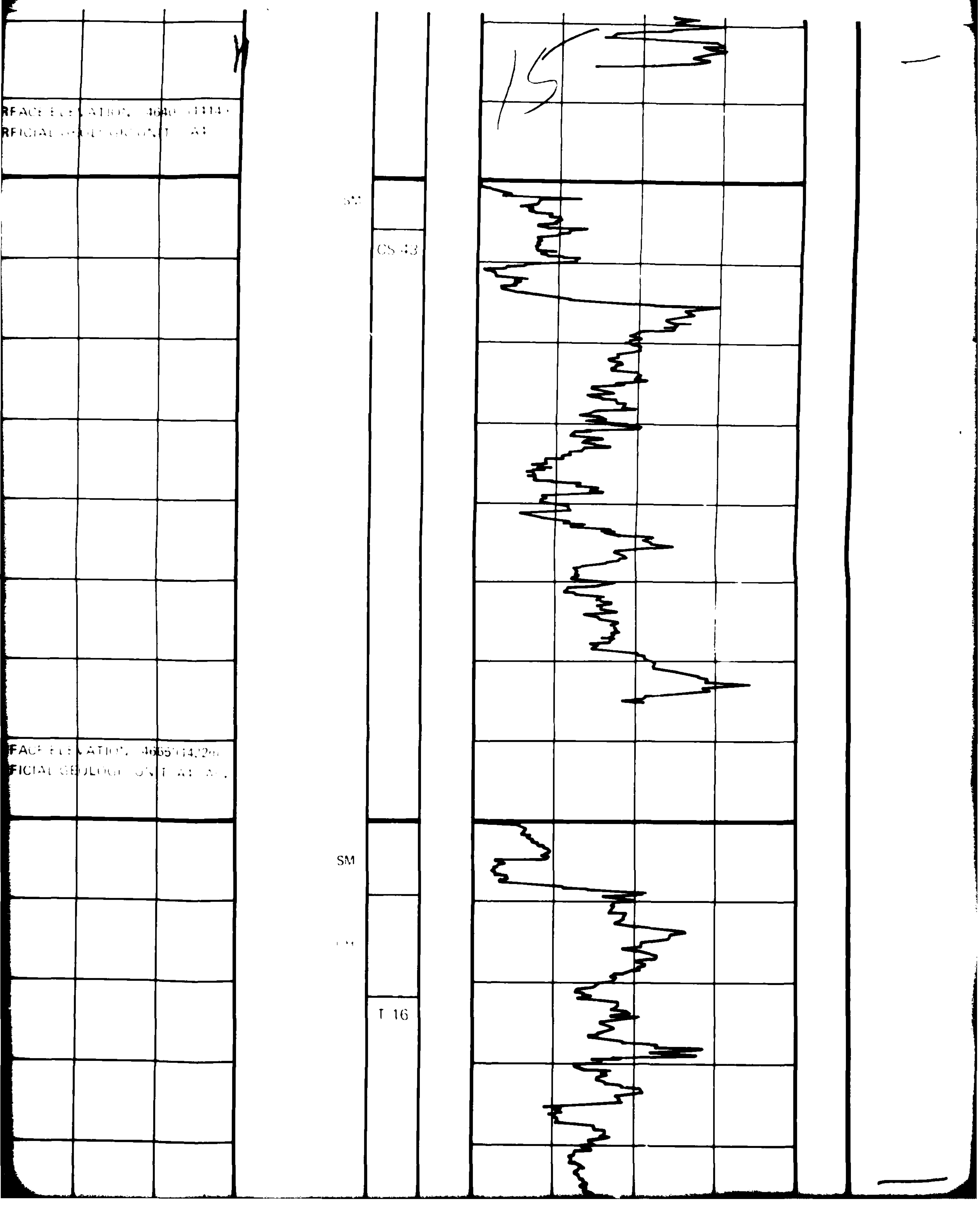

3
10
0
1
5
2
3
10
4
15
5
6
20
30
10
35

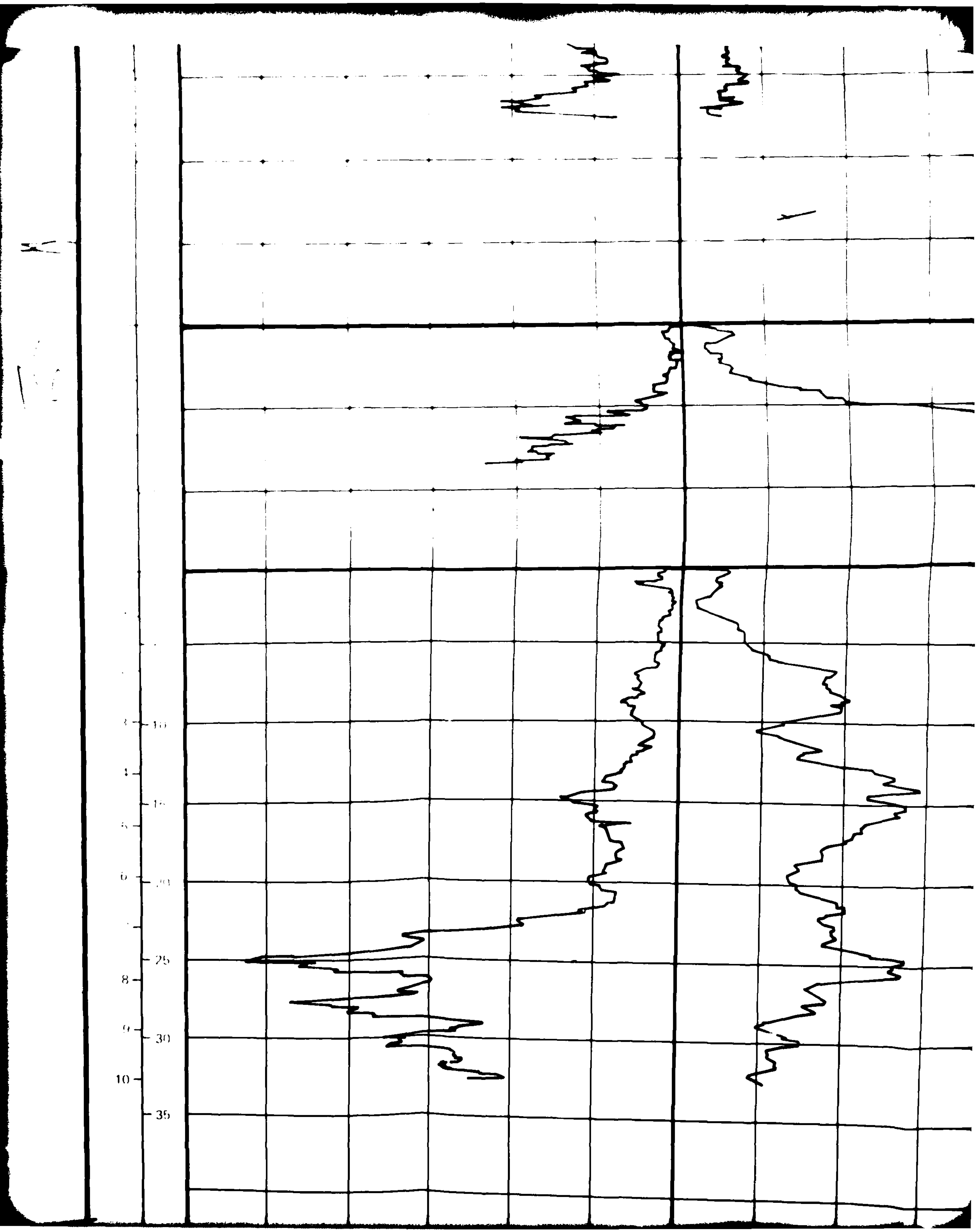


SM
CS 30
C 30 SURFACE ELEVATION
SURFICIAL GEOLOGIC UNIT
12
T 13
C 31 SURFACE ELEVATION 5045' (1538m)
SURFICIAL GEOLOGIC UNIT
SM
SP
SM
B 3
C 32 SURFACE ELEVATION: 4875 (1486m)
SURFICIAL GEOLOGIC UNIT
SM
P 9

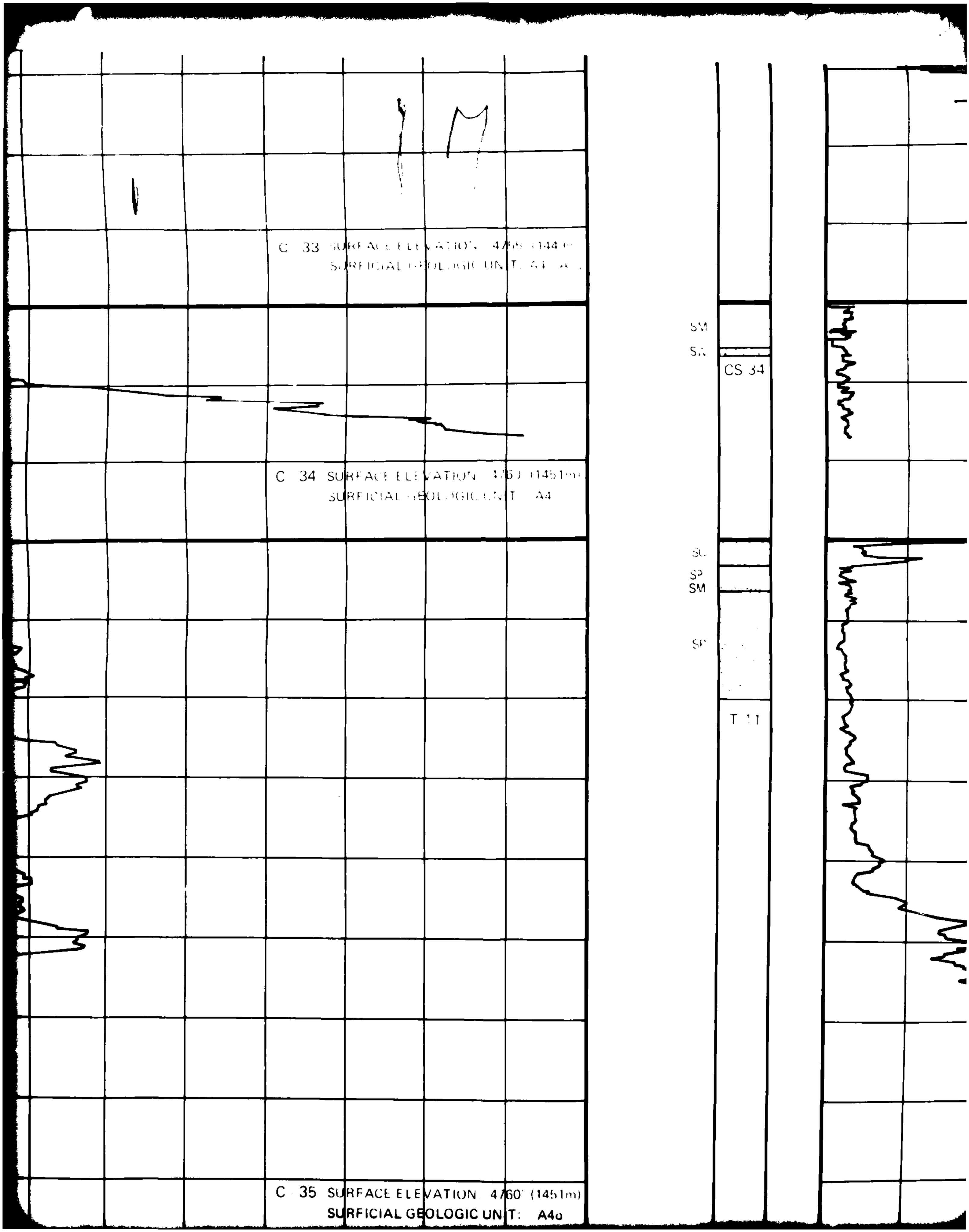

0
0
1
5
2
3
10
4
15
6
20


14
C-42 SURFACE ELEVATION 4640 (1414m)
SURFICIAL GEOLOGIC UNIT A4
C 43 SURFACE ELEVATION 4665
SURFICIAL GEOLOGIC UNIT A1

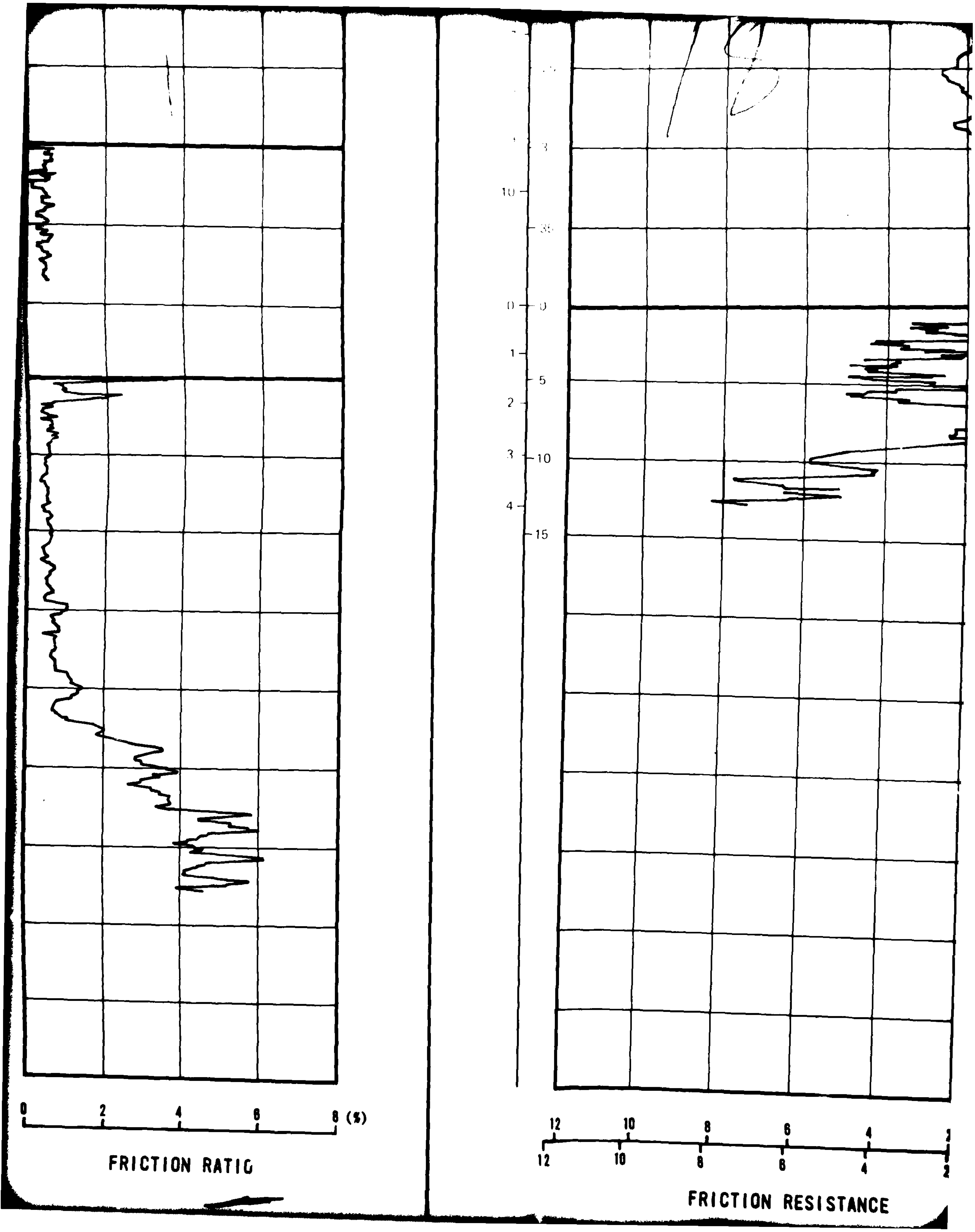

15
SM
CS 43
SM
T 16



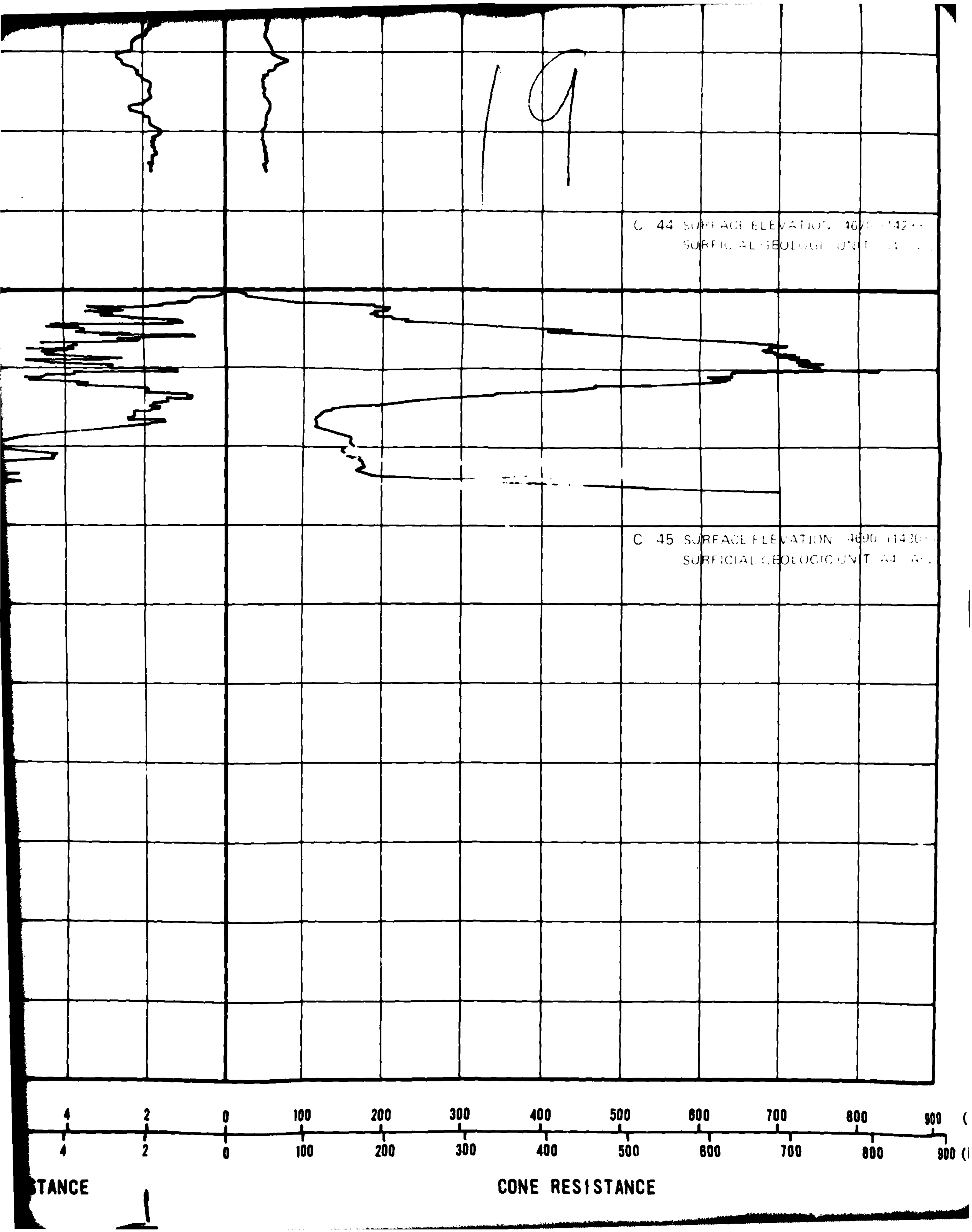
25
8
30
10
35

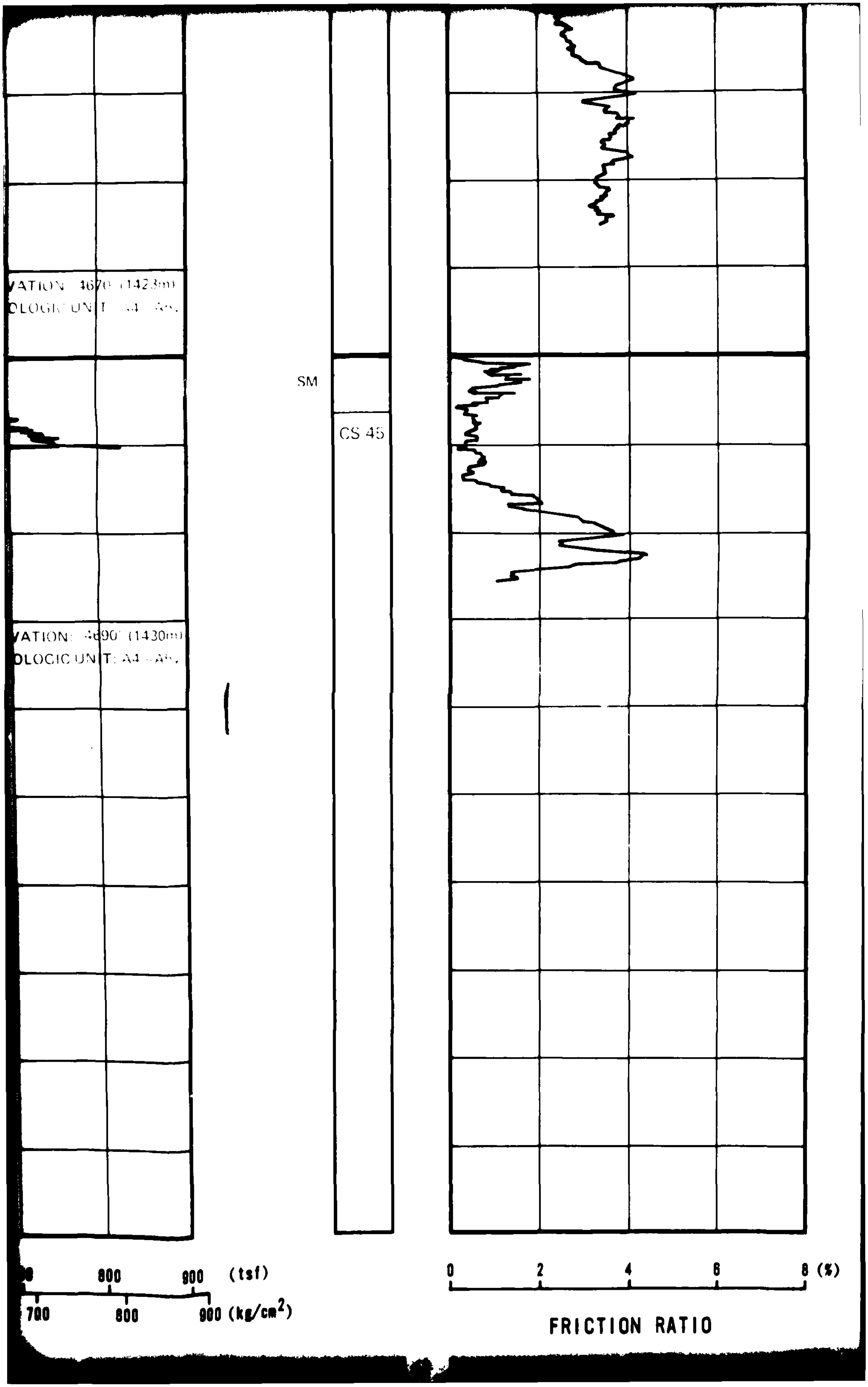


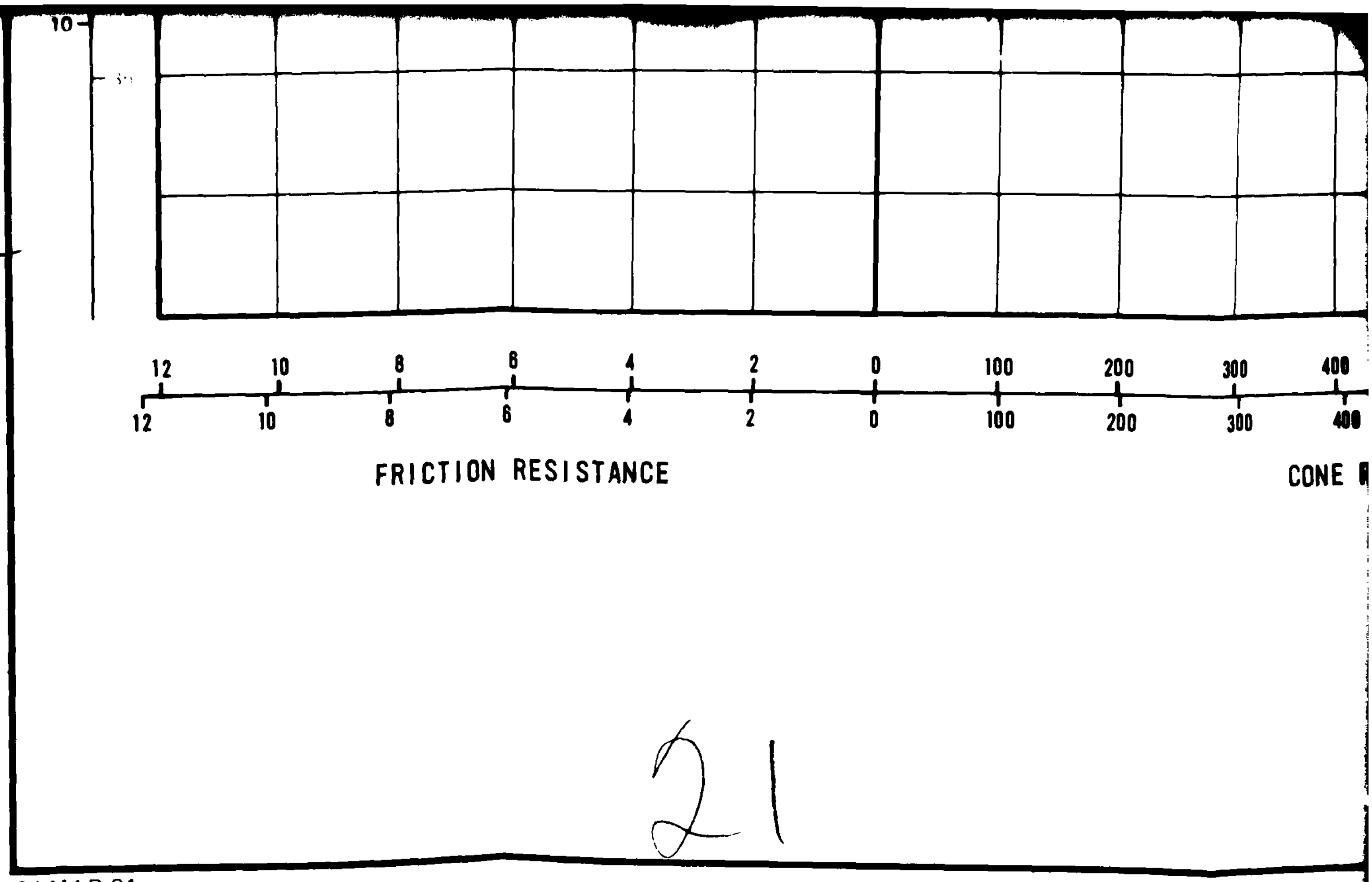
C 34 SURFACE ELEVATION
SURFICIAL GEOLOGIC UNIT A4
C 35 SURFACE ELEVATION 4760' (1451m)
SURFICIAL GEOLOGIC UNIT: A4o
SM
CS 34
SM



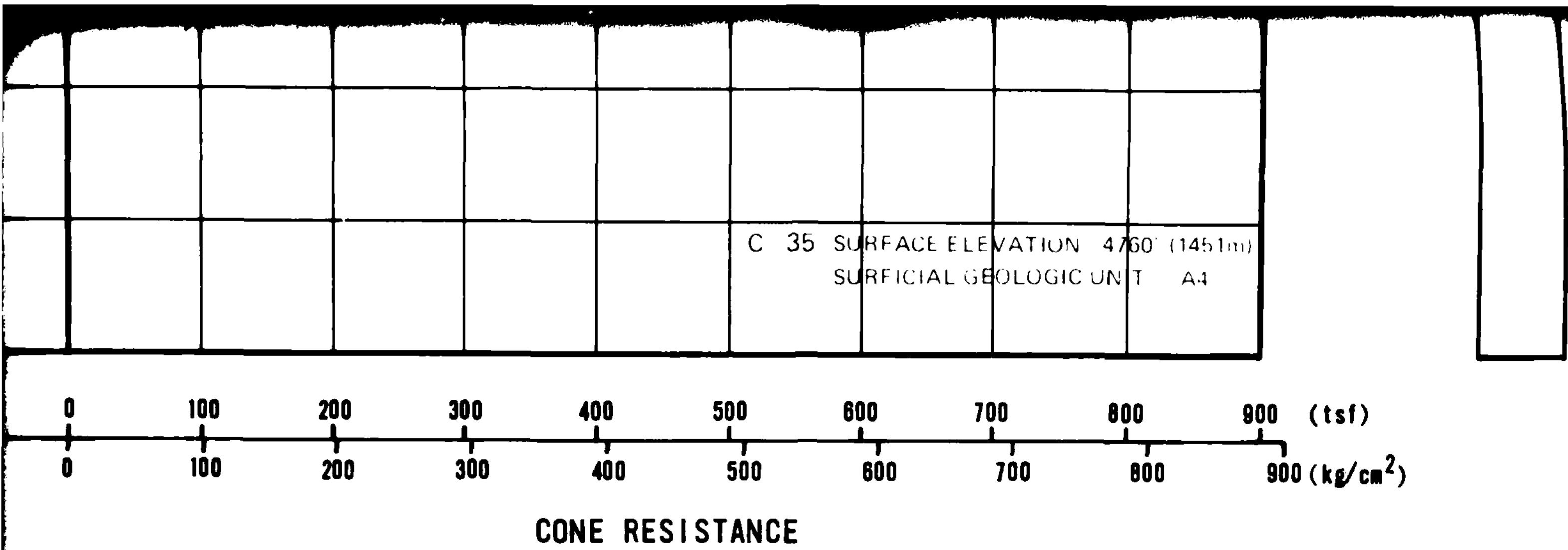
0
2
4
6
8 (%)
FRICTION RATIO
12
10
8
6
4
2
FRICTION RESISTANCE


19
C 44 SURFACE ELEVATION
C 45 SURFACE ELEVATION 4690
SURFICIAL GEOLOGIC UNIT
4 2 0 100 200 300 400 500 600 700 800 900
4 2 0 100 200 300 400 500 600 700 800 900
CONE RESISTANCE
1


VATION: 4670' (1423m)
OLOGIC UNIT: A4 - A6
VATION: 4690' (1430m)
OLOGIC UNIT: A4 - A6
SM
CS 45
800
900
(tsf)
700
800
900 (kg/cm²)
0
2
4
6
8 (%)
FRICTION RATIO


10
12 10 8 6 4 2 0 100 200 300 400
12 10 8 6 4 2 0 100 200 300 400
FRICTION RESISTANCE
CONE
21

24 MAR 81


C 35 SURFACE ELEVATION 4760' (1451m)
SURFICIAL GEOLOGIC UNIT A4
0 100 200 300 400 500 600 700 800 900 (tsf)
0 100 200 300 400 500 600 700 800 900 (kg/cm2)
CONE RESISTANCE

22

CONE PENETROMETER TEST RESULTS
WAH WAH VALLEY, UTAH

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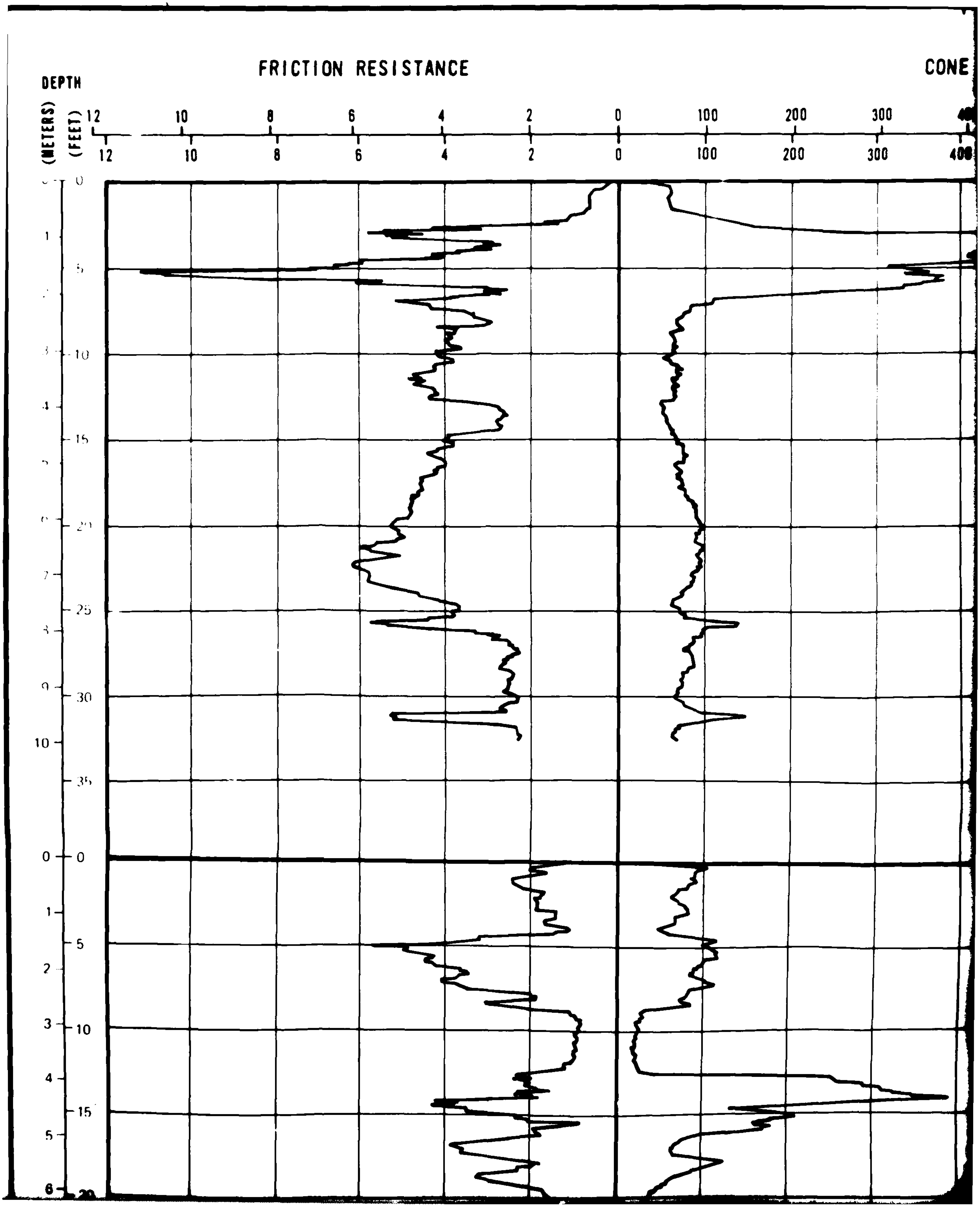
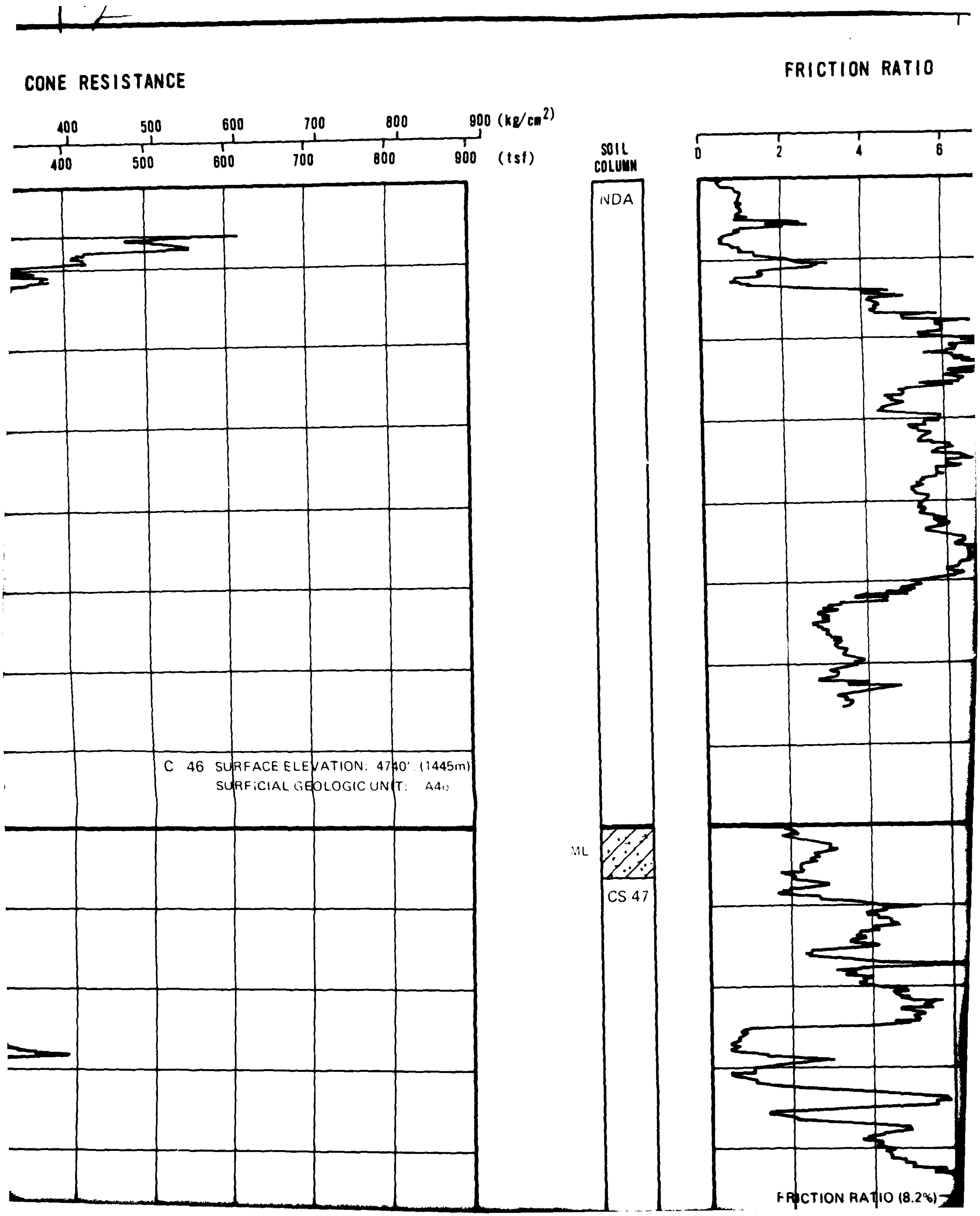
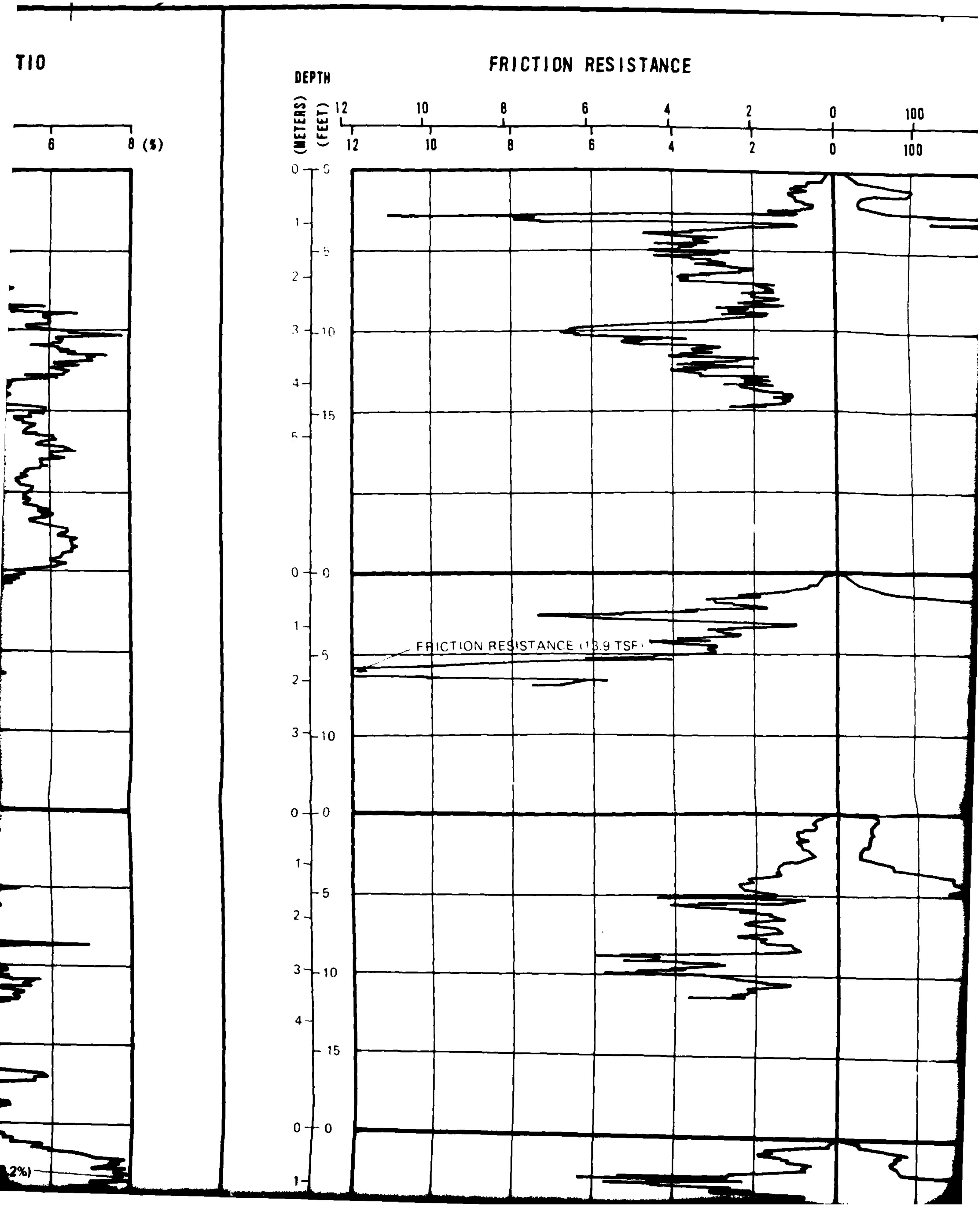
II-10-1
2 OF 4

23

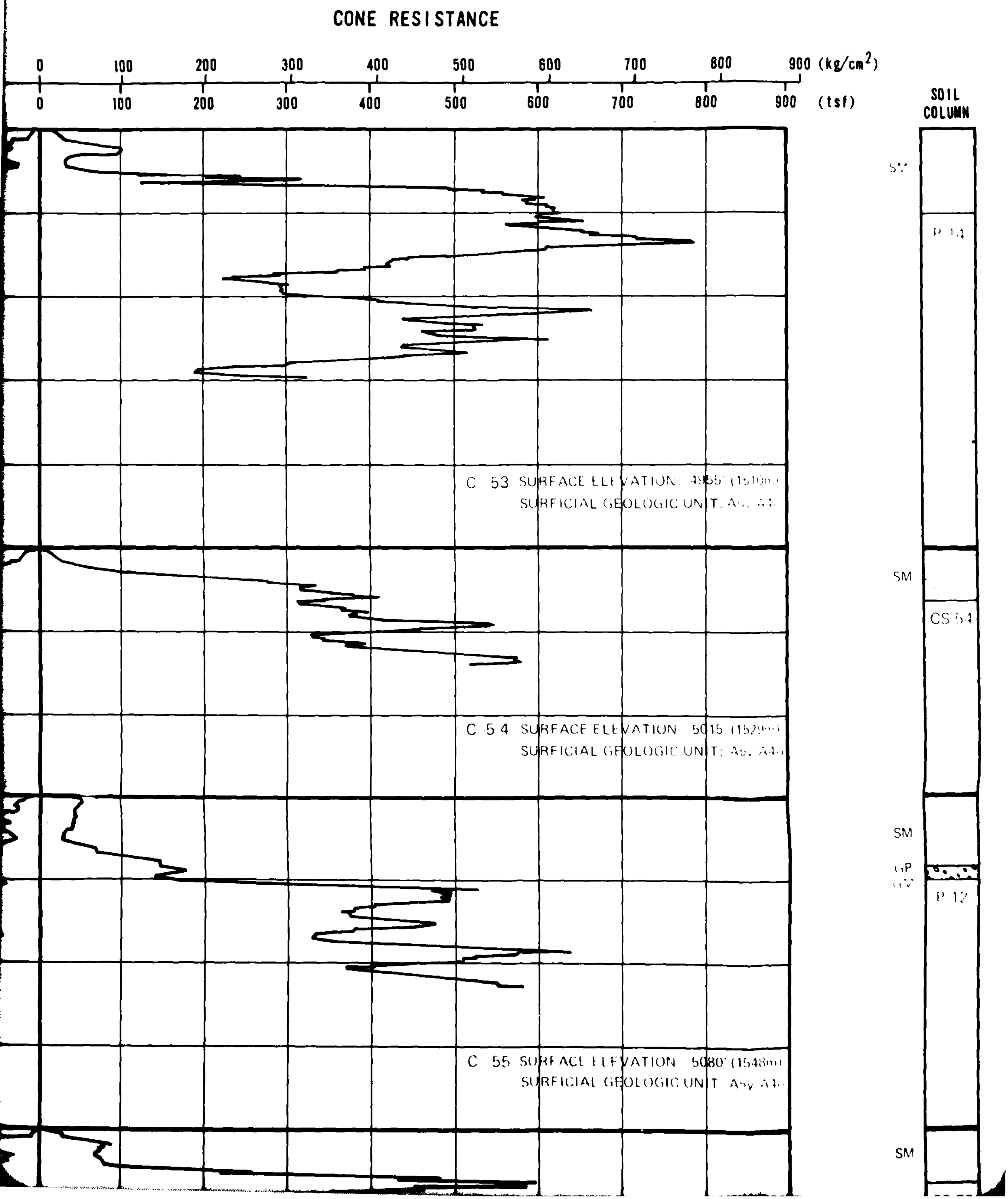
FUGRO NATIONAL, INC.

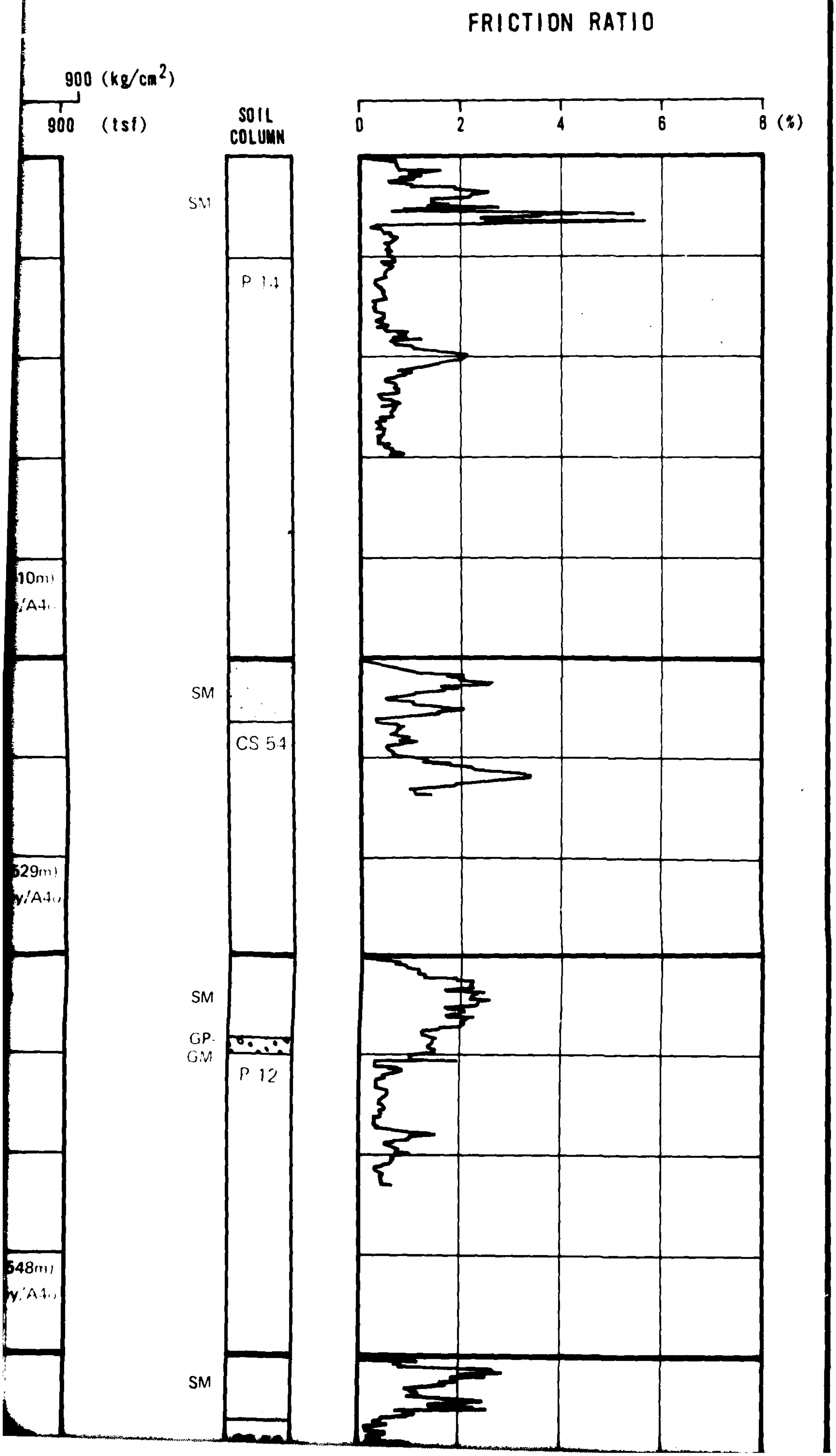

FRICTION RESISTANCE
CONE
DEPTH
(METERS)
(FEET)
12 10 8 6 4 2 0 100 200 300 400
0 5 10 15 20 25 30 35
1 2 3 4 5 6 7 8 9 10
0 5 10 15 20
0 1 2 3 4 5 6


CONE RESISTANCE
400 500 600 700 800 900 (kg/cm2)
400 500 600 700 800 900 (tsf)
SOIL COLUMN
NDA
ML
CS 47
FRICTION RATIO
0 2 4 6
C 46 SURFACE ELEVATION: 4740' (1445m)
SURFICIAL GEOLOGIC UNIT: A4
FRICTION RATIO (8.2%)

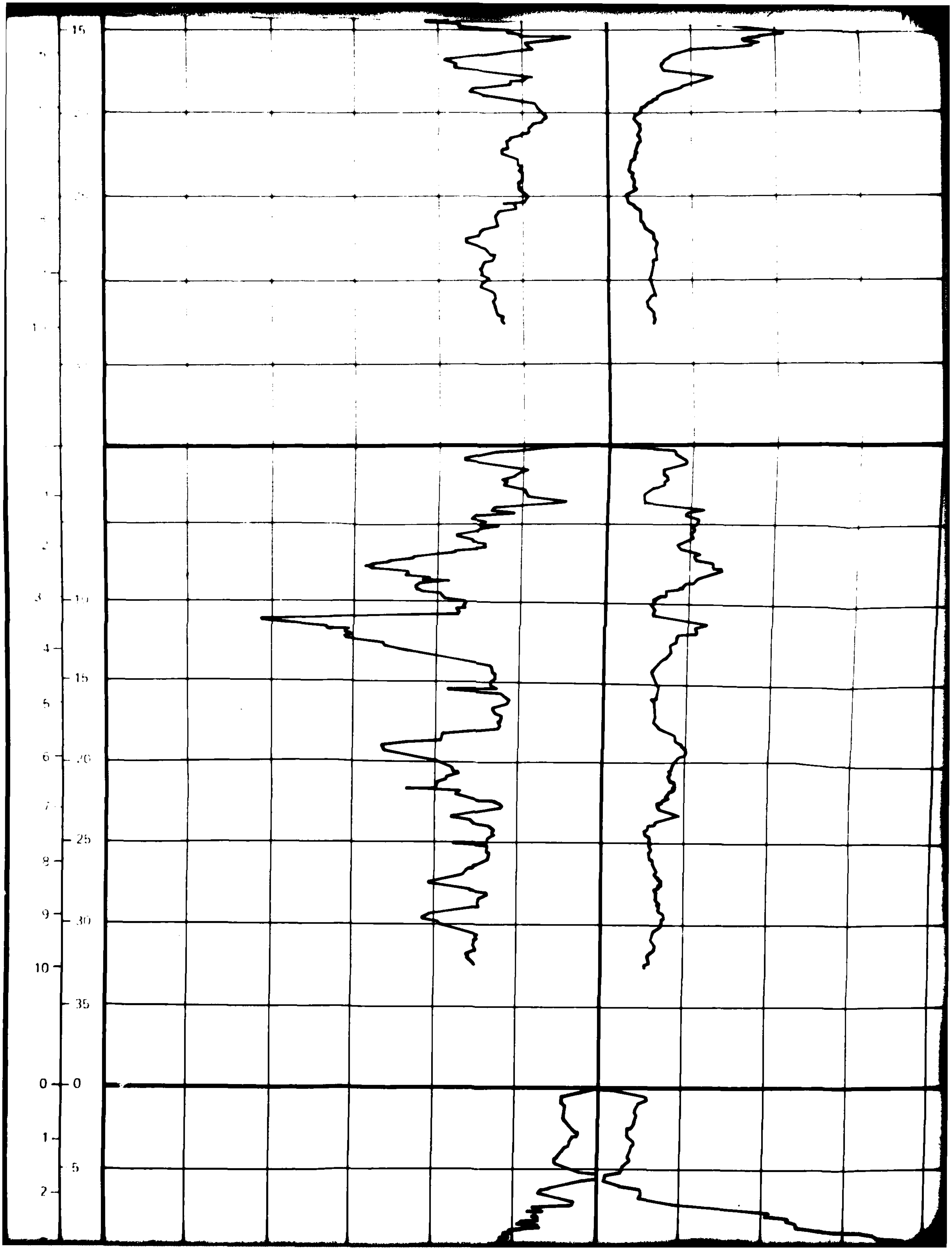

TIO
8 (%)
FRICTION RESISTANCE
DEPTH
(METERS)
(FEET)
FRICTION RESISTANCE (13.9 TSF)

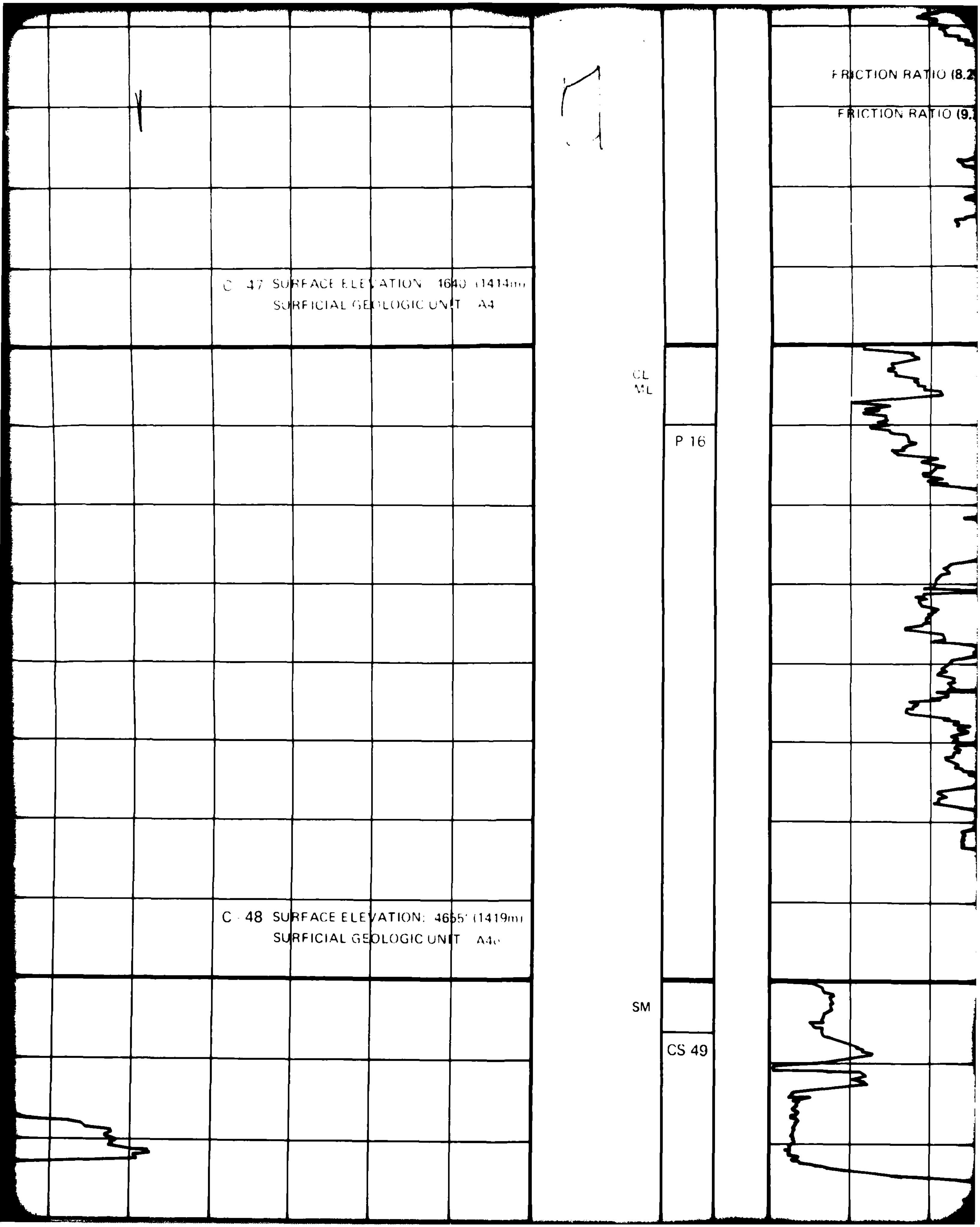
4

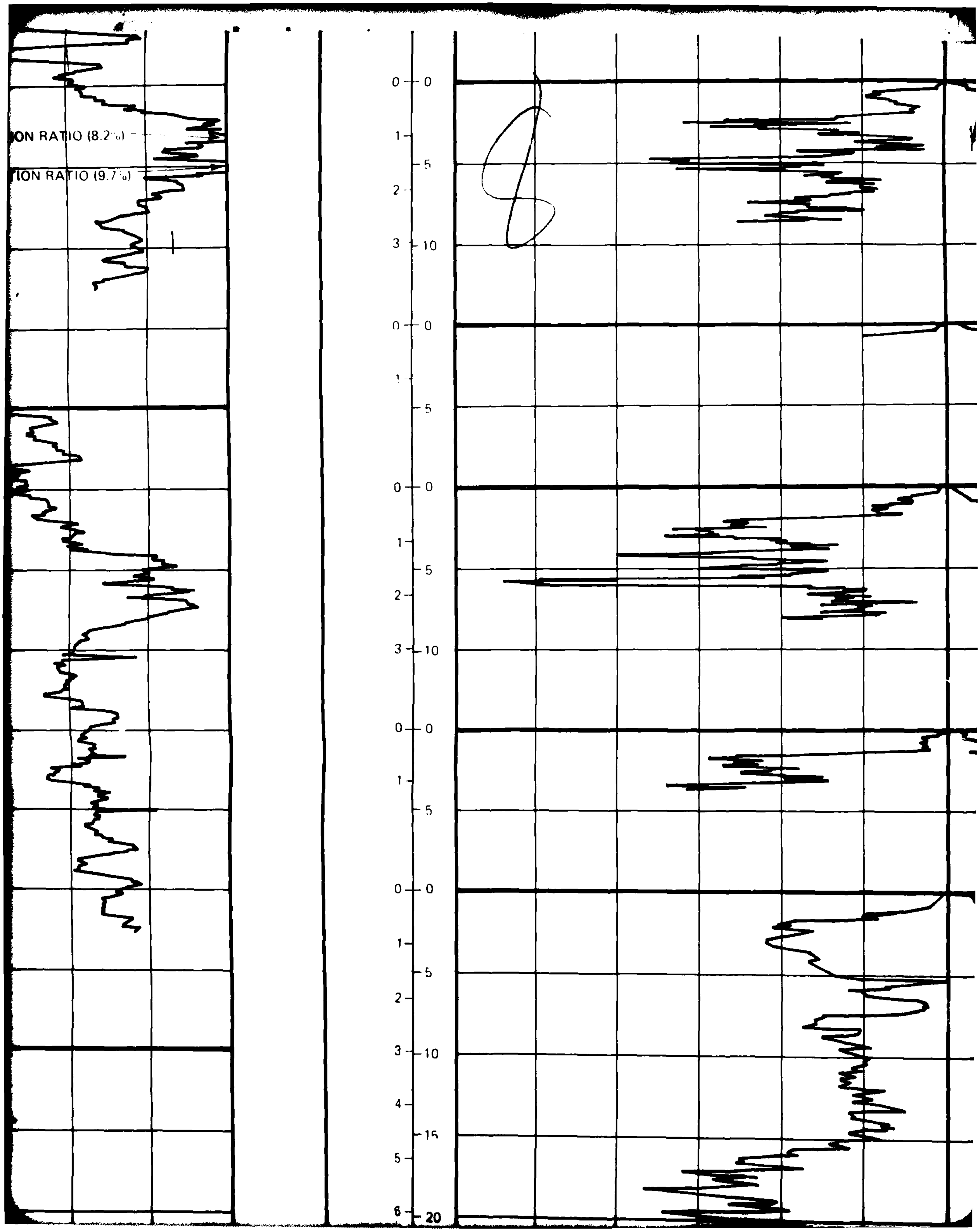

CONE RESISTANCE
0 100 200 300 400 500 600 700 800 900 (kg/cm2)
0 100 200 300 400 500 600 700 800 900 (tsf)
SOIL COLUMN
C 53 SURFACE ELEVATION
SURFICIAL GEOLOGIC UNIT
SM
CS 54
C 54 SURFACE ELEVATION 5015
SURFICIAL GEOLOGIC UNIT
SM
GP
P 12
C 55 SURFACE ELEVATION 5080' (1548m)
SURFICIAL GEOLOGIC UNIT
SM



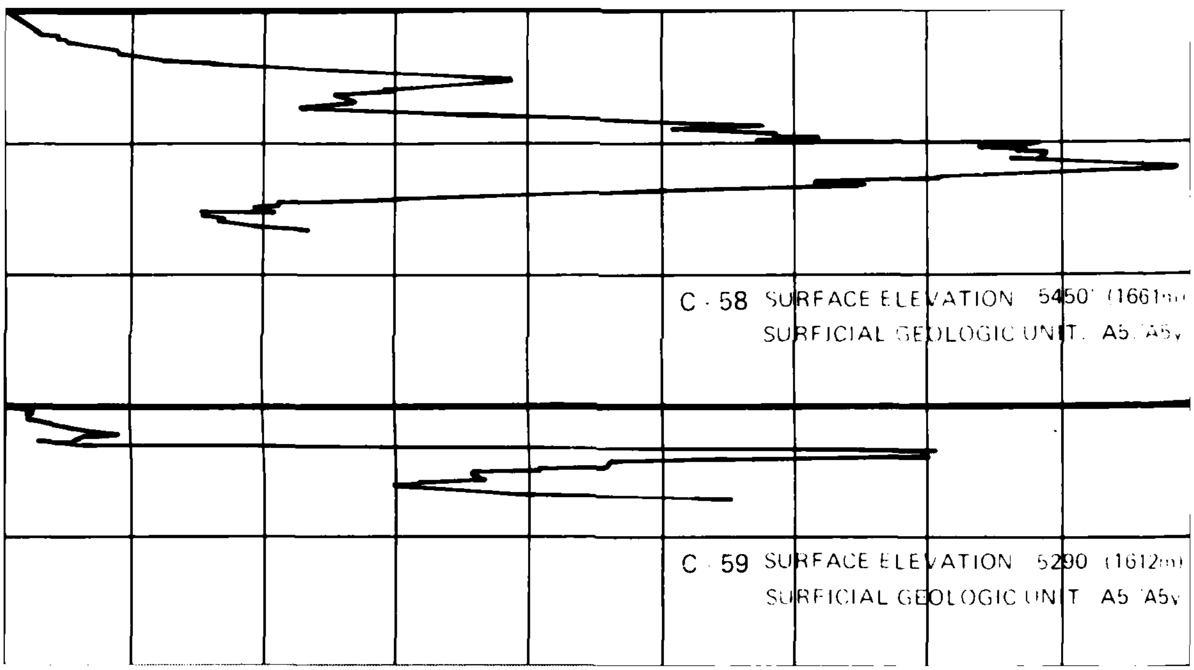
FRICTION RATIO
900 (kg/cm²)
900 (tsf)
SOIL COLUMN
0
2
4
6
8 (%)
SM
P 14
10m)
/A4
SM
CS 54
529m)
y/A4
SM
GP-
GM
P 12
548m)
y/A4
SM

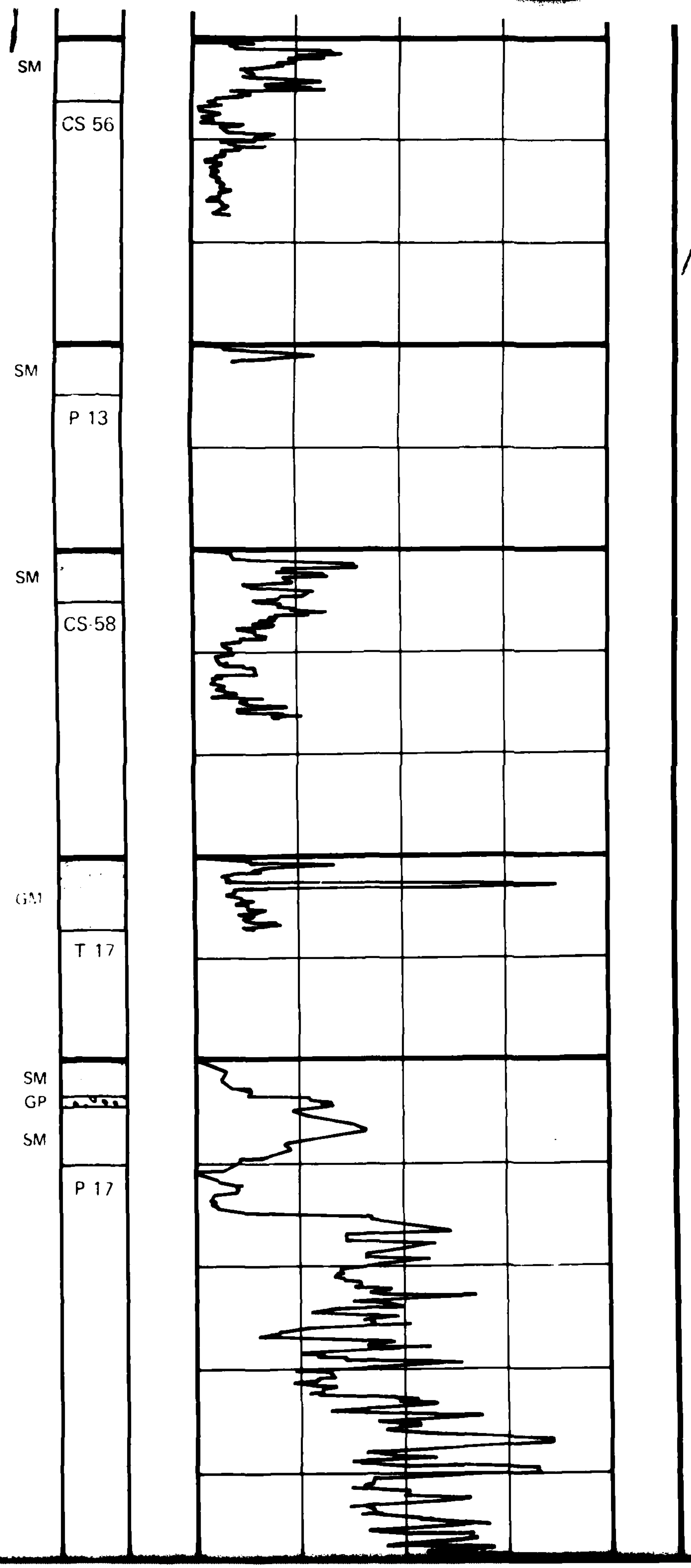

15
3
4
15
5
6
20
7
25
8
9
30
10
35
0
0
1
5
2

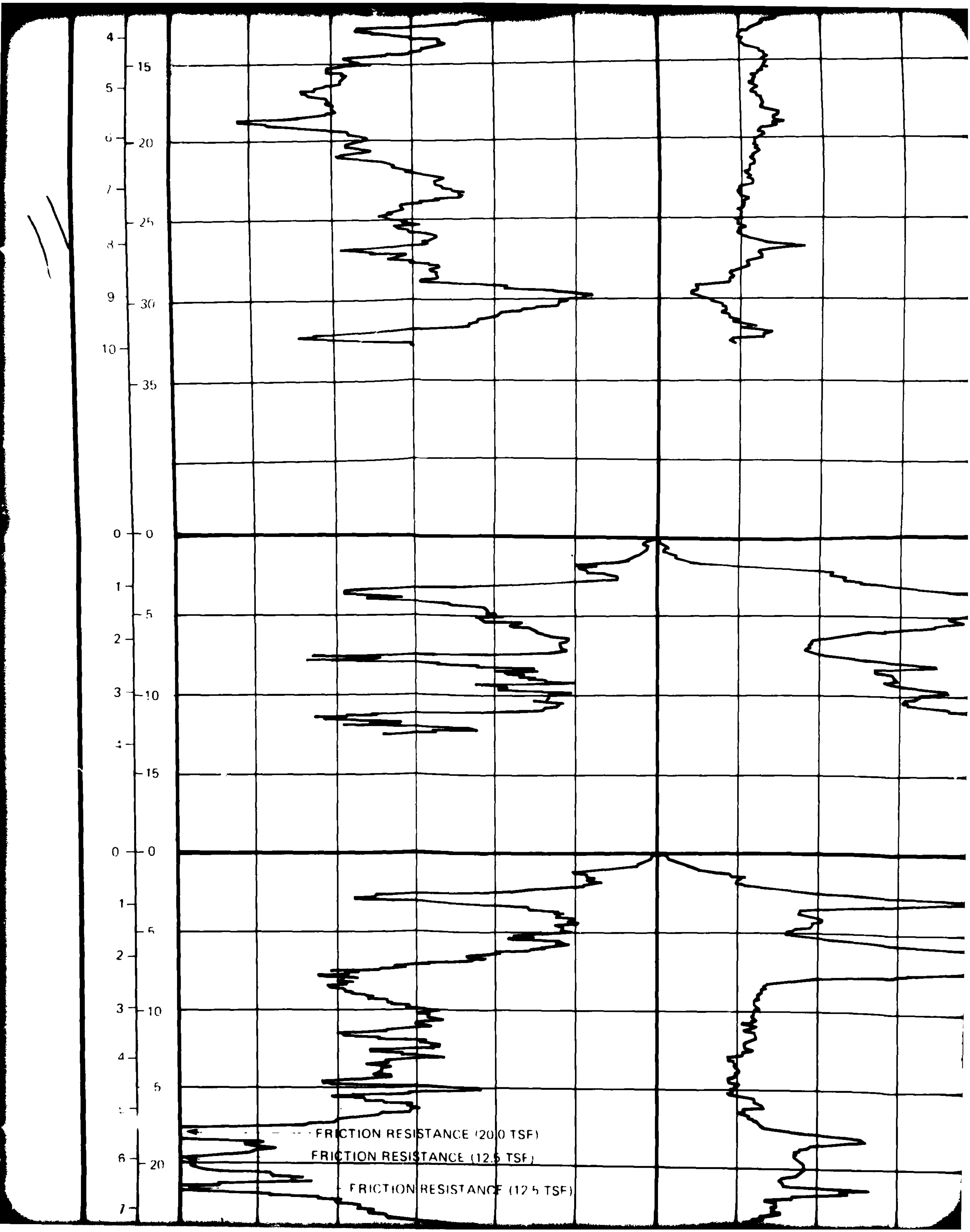

FRICTION RATIO (8.2
FRICTION RATIO (9.
C - 47 SURFACE ELEVATION: 1640 (1414m)
SURFICIAL GEOLOGIC UNIT: A4
CL
ML
P 16
C - 48 SURFACE ELEVATION: 4655' (1419m)
SURFICIAL GEOLOGIC UNIT: A4
SM
CS 49



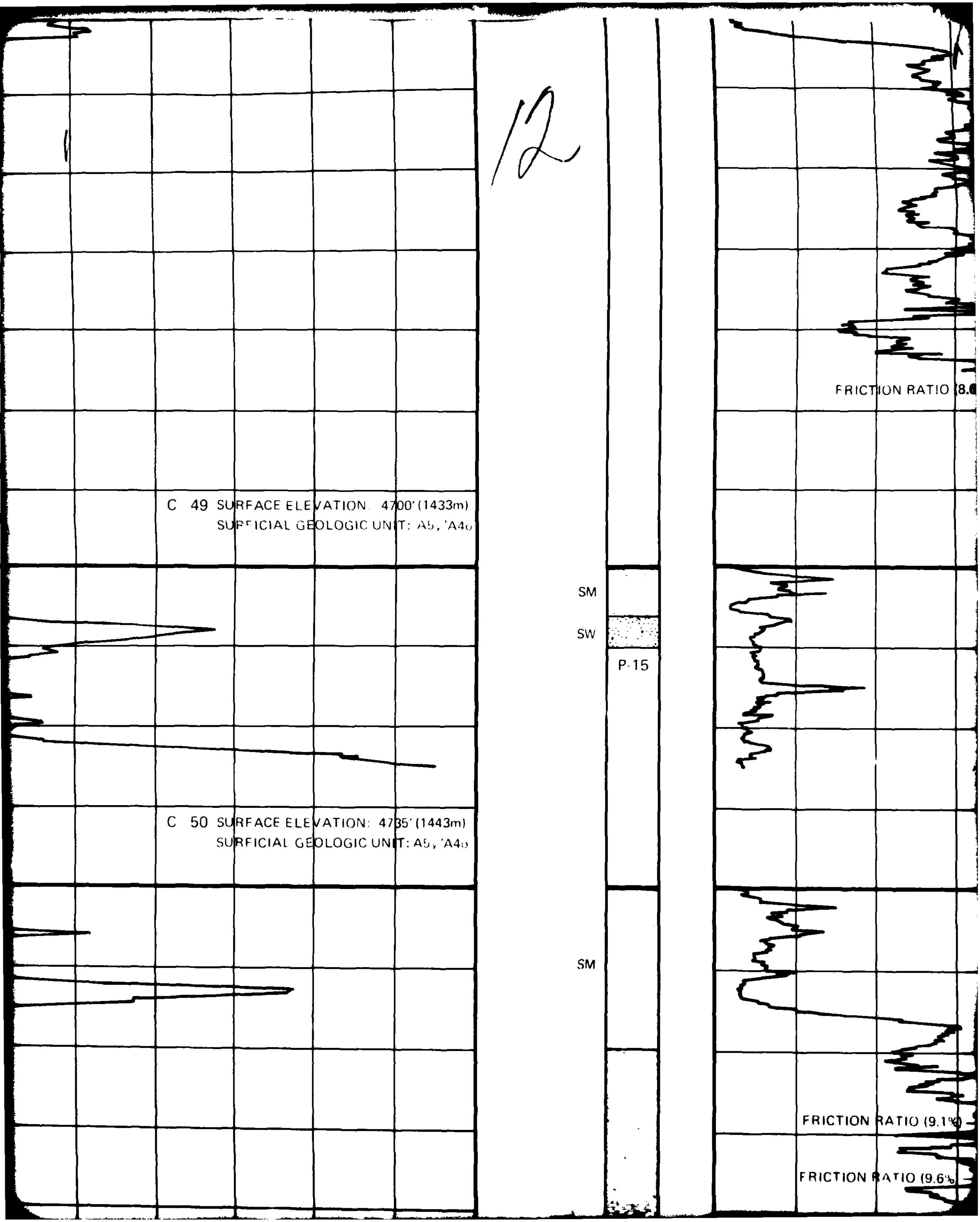
ION RATIO (8.2%)
TION RATIO (9.7%)
0 1 2 3
0 5 10
0 1
0 5
0 1 2 3
0 5 10
0 1
0 5
0 1 2 3 4 5 6
0 5 10 15 20


C - 58 SURFACE ELEVATION 5450' (1661
SURFICIAL GEOLOGIC UNIT: A5
C - 59 SURFACE ELEVATION 5290' (1612
SURFICIAL GEOLOGIC UNIT A5

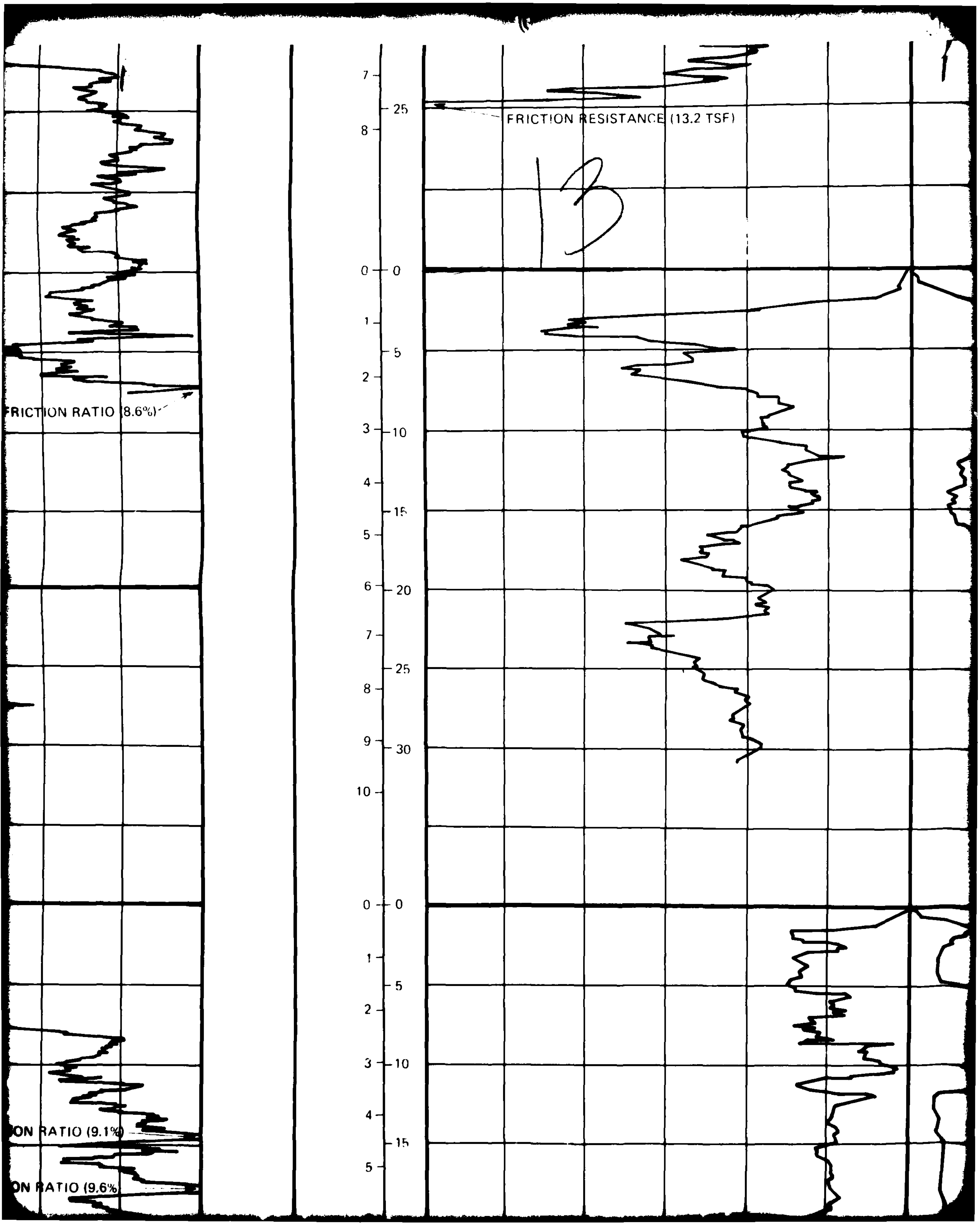

SM
CS 56
SM
P 13
SM
CS-58
GM
T 17
SM
GP
SM
P 17

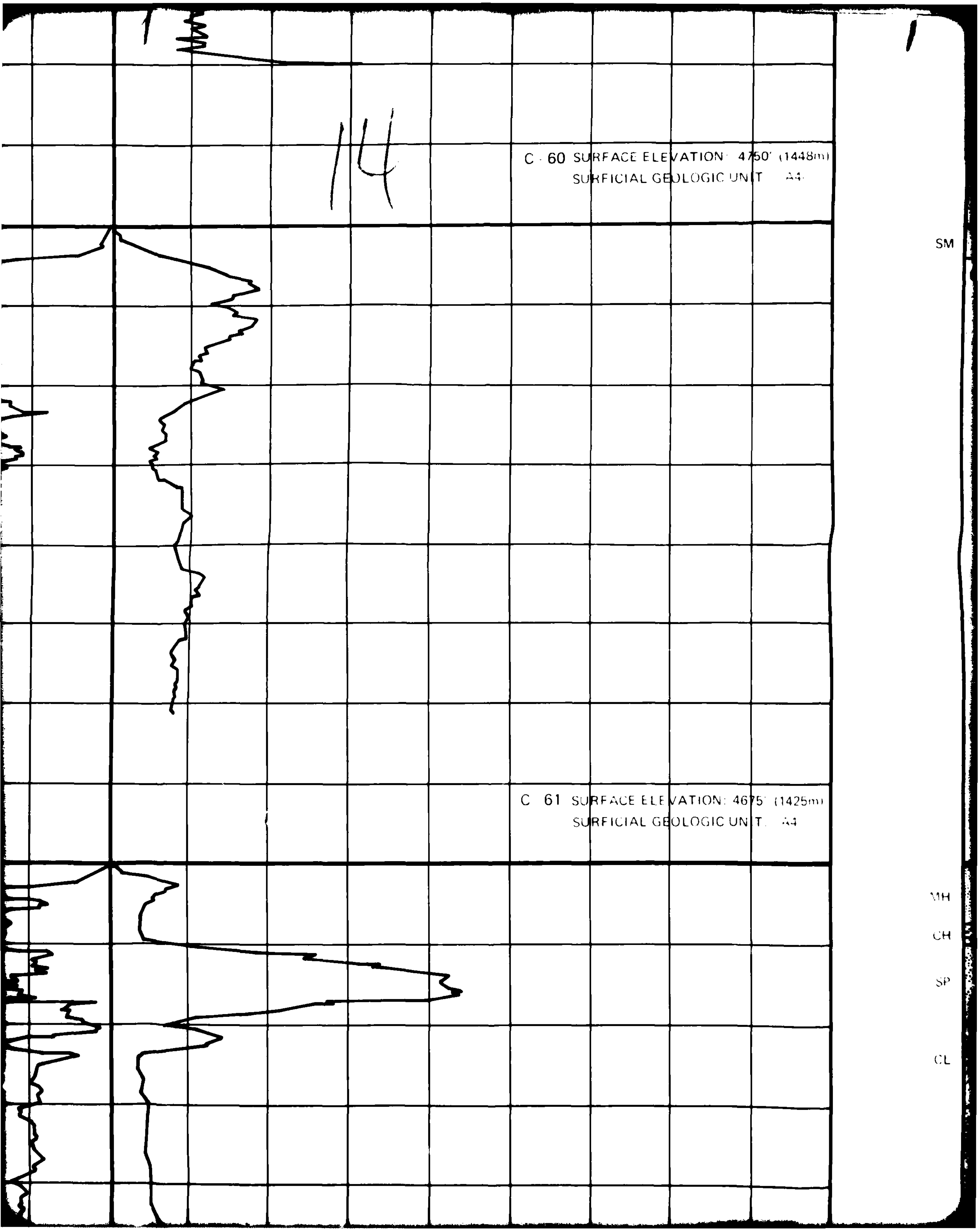


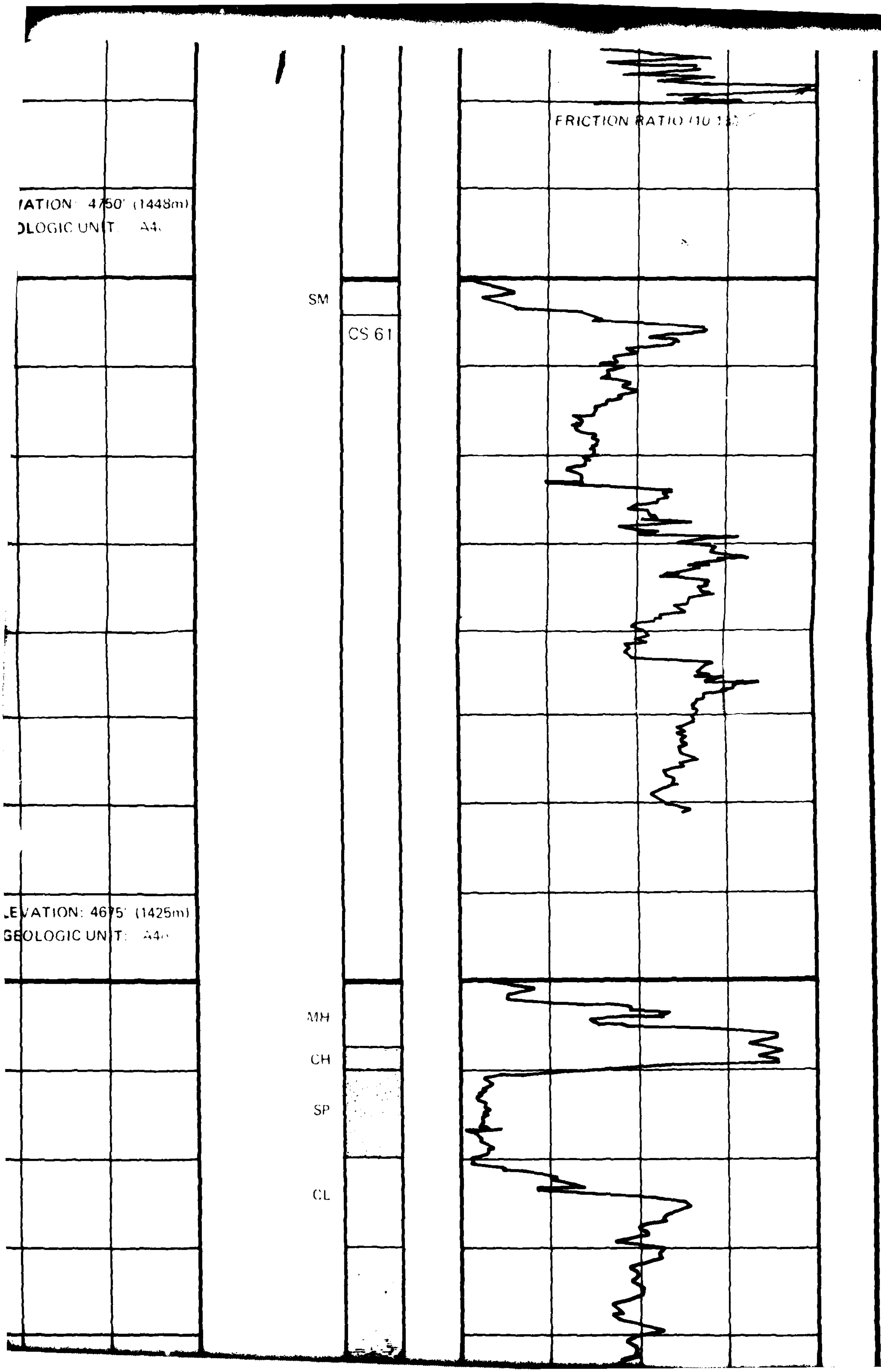
FRICTION RESISTANCE (20.0 TSF)
FRICTION RESISTANCE (12.5 TSF)
FRICTION RESISTANCE (12.5 TSF)



12
FRICTION RATIO (8.
C 49 SURFACE ELEVATION: 4700' (1433m)
SURFICIAL GEOLOGIC UNIT: A5, 'A4
SM
SW
P-15
C 50 SURFACE ELEVATION: 4735' (1443m)
SURFICIAL GEOLOGIC UNIT: A5, 'A4
SM
FRICTION RATIO (9.1%)
FRICTION RATIO (9.6%)

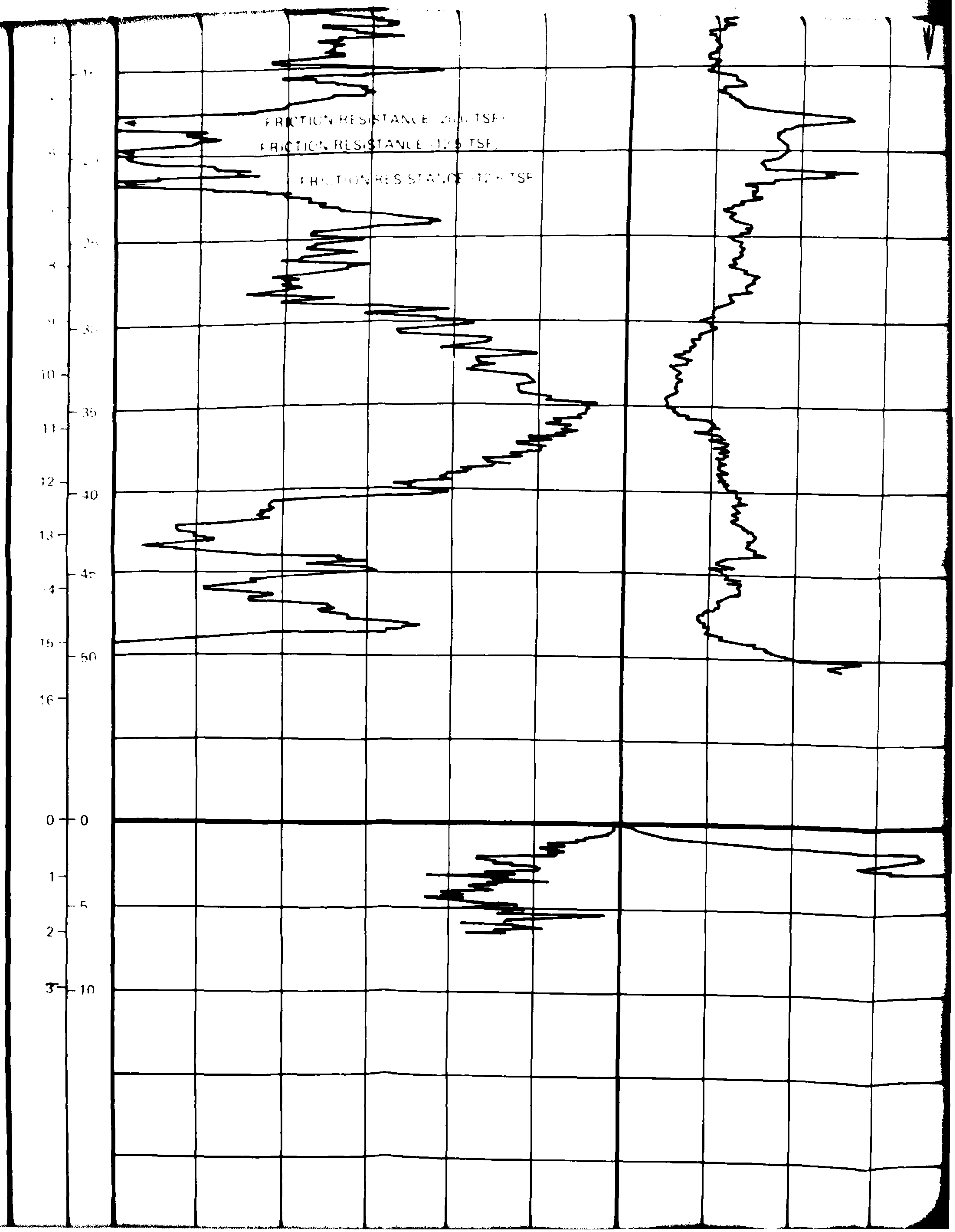

FRICTION RESISTANCE (13.2 TSF)
FRICTION RATIO (8.6%)
ON RATIO (9.1%)
ON RATIO (9.6%)
13
7
8
0
1
2
3
4
5
6
7
8
9
10
0
1
2
3
4
5
25
0
5
10
15
20
25
30
0
5
10
15

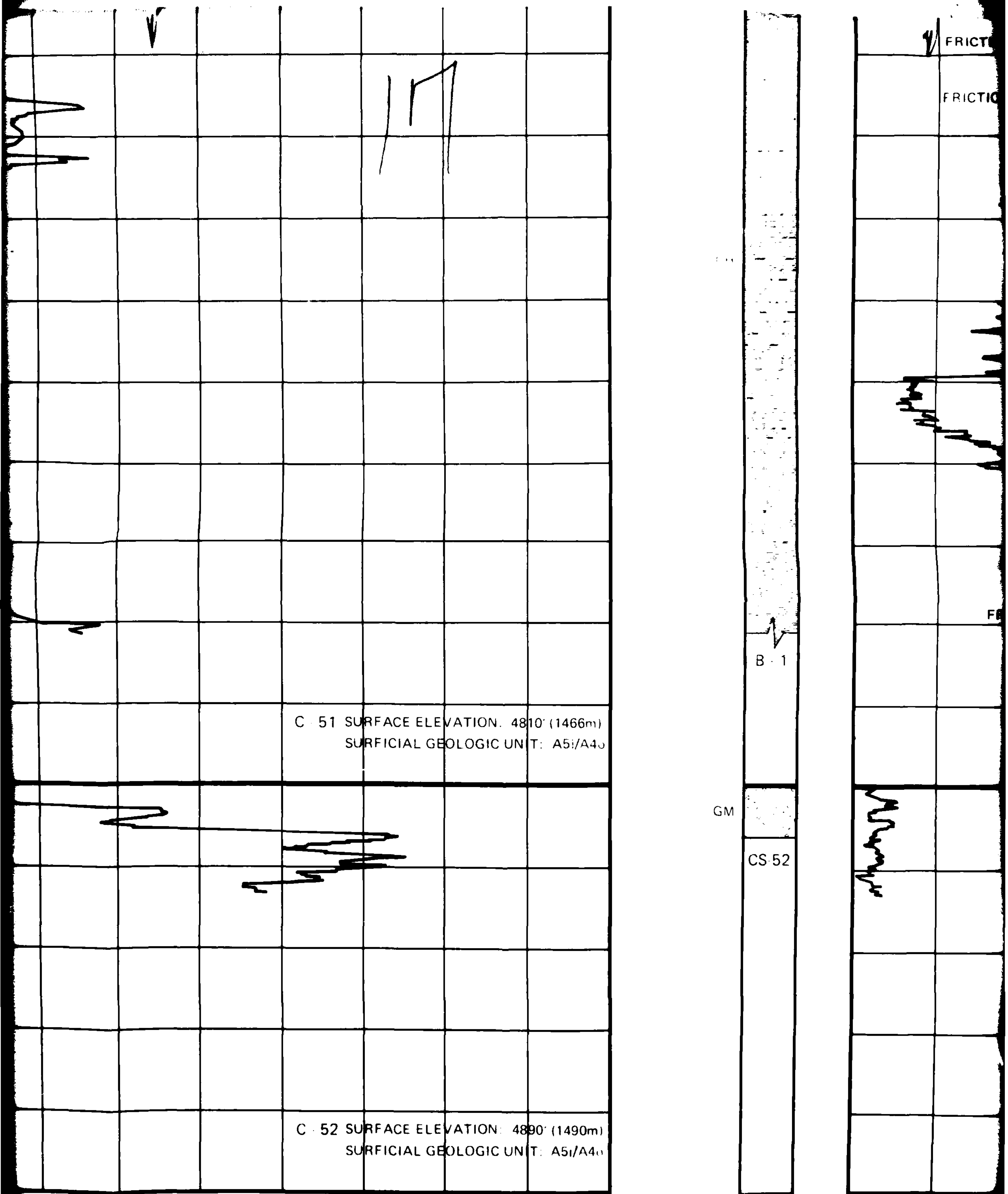

14
C - 60 SURFACE ELEVATION: 4750' (1448m)
SURFICIAL GEOLOGIC UNIT A4
SM
C 61 SURFACE ELEVATION: 4675' (1425m)
SURFICIAL GEOLOGIC UNIT A4
MH
CH
SP
CL


FRICTION RATIO (10 1
ATION: 4750' (1448m)
LOGIC UNIT: A4
SM
CS 61
EVATION: 4675' (1425m)
GEOLOGIC UNIT: A4
MH
CH
SP
CL

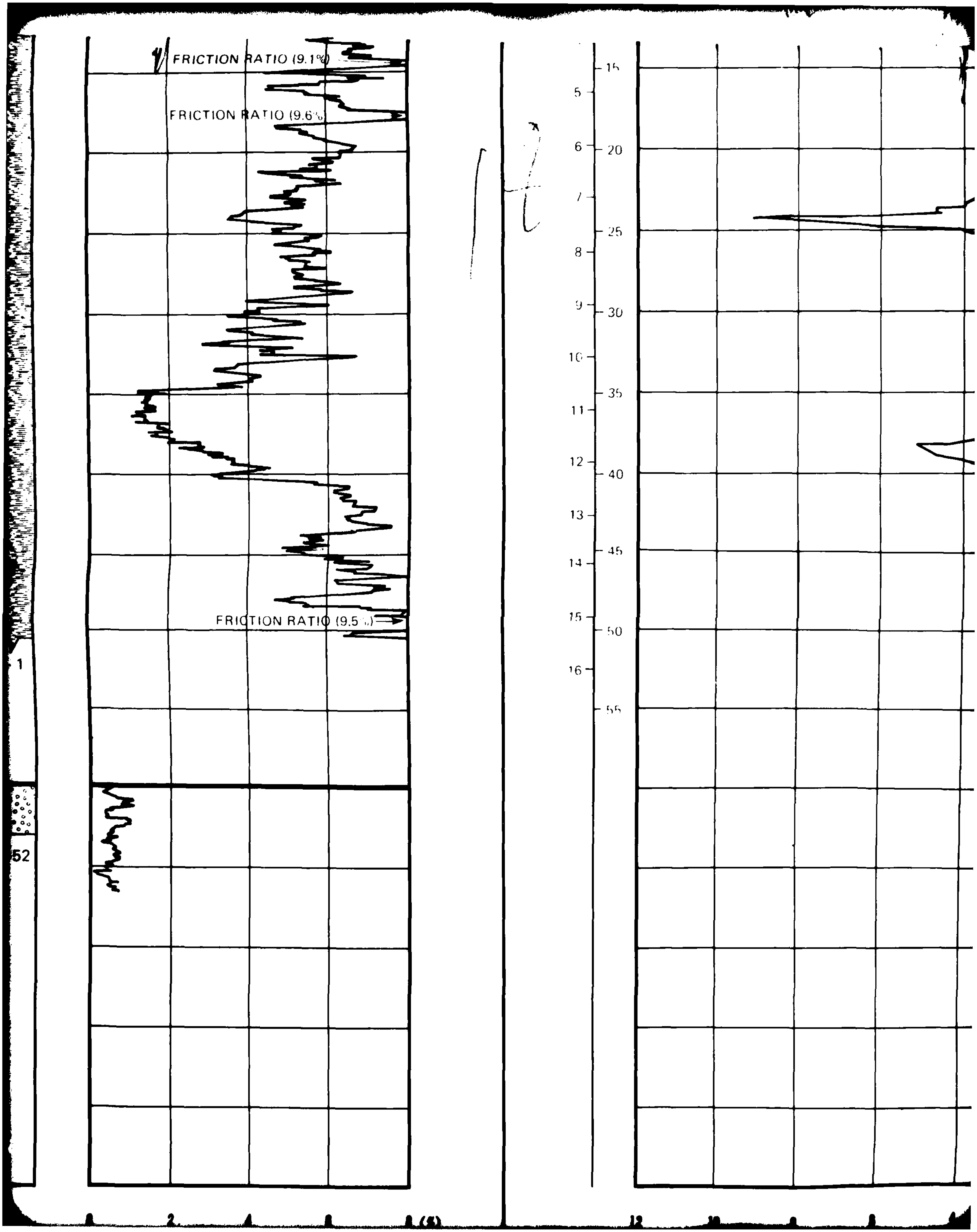
15

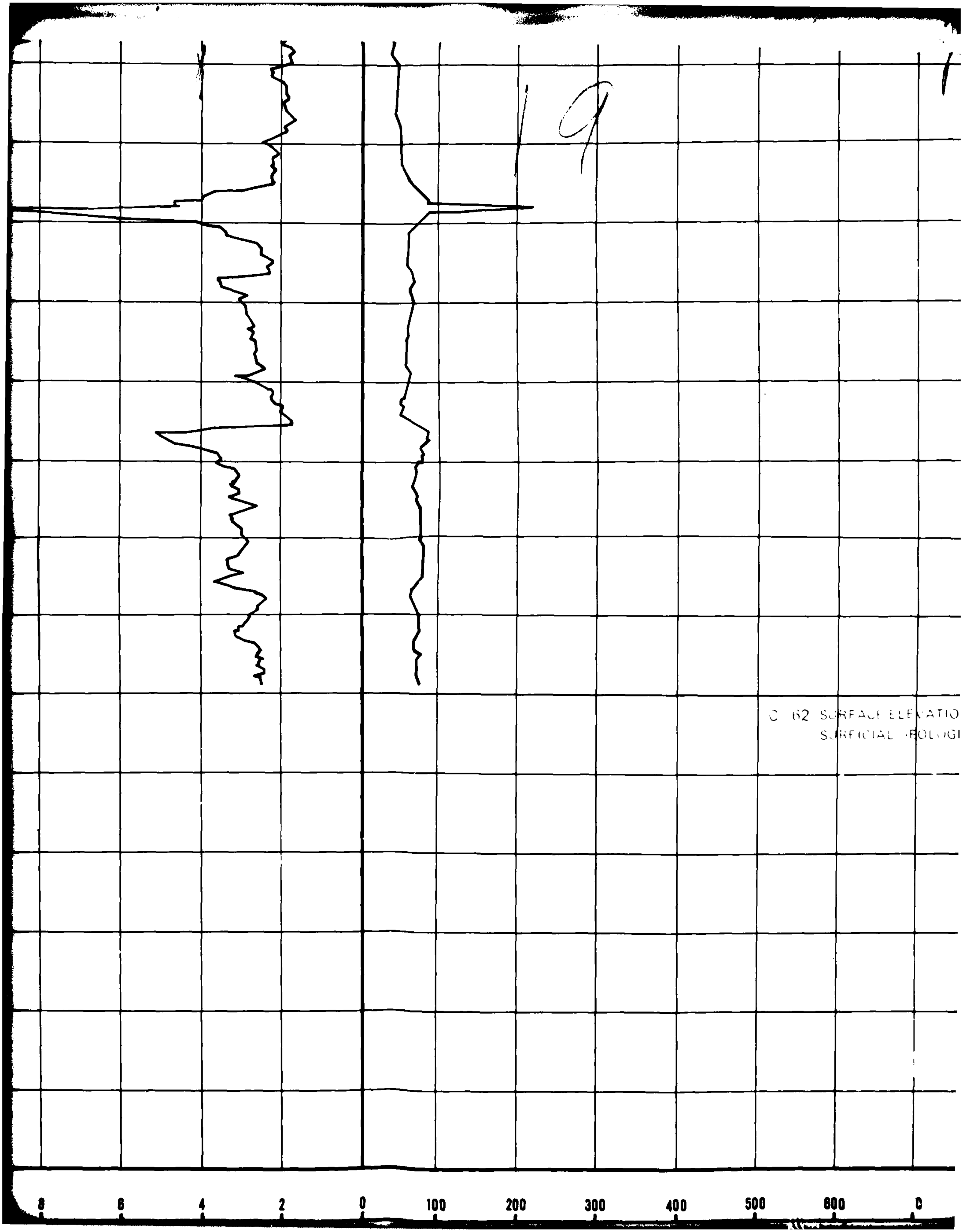
16

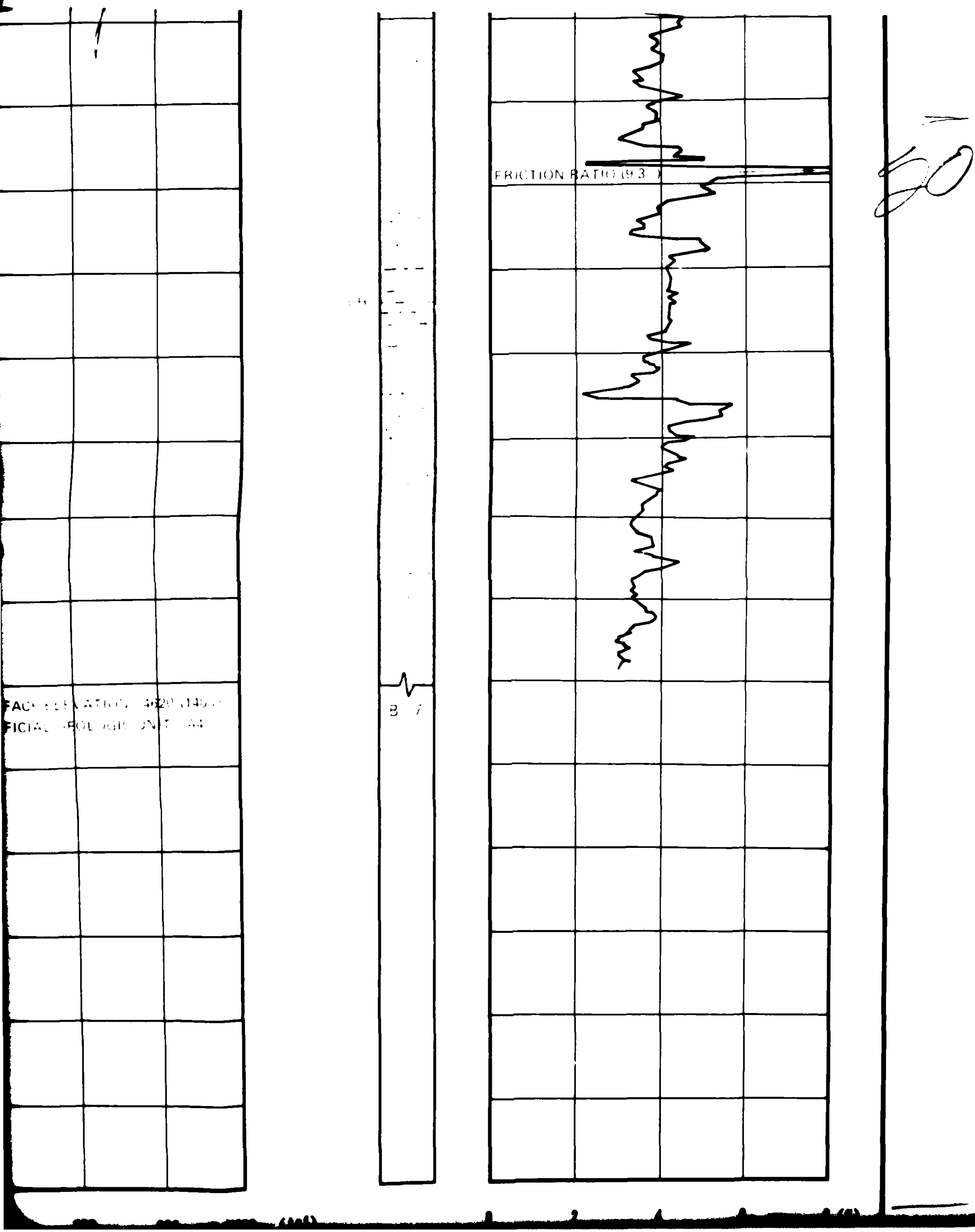




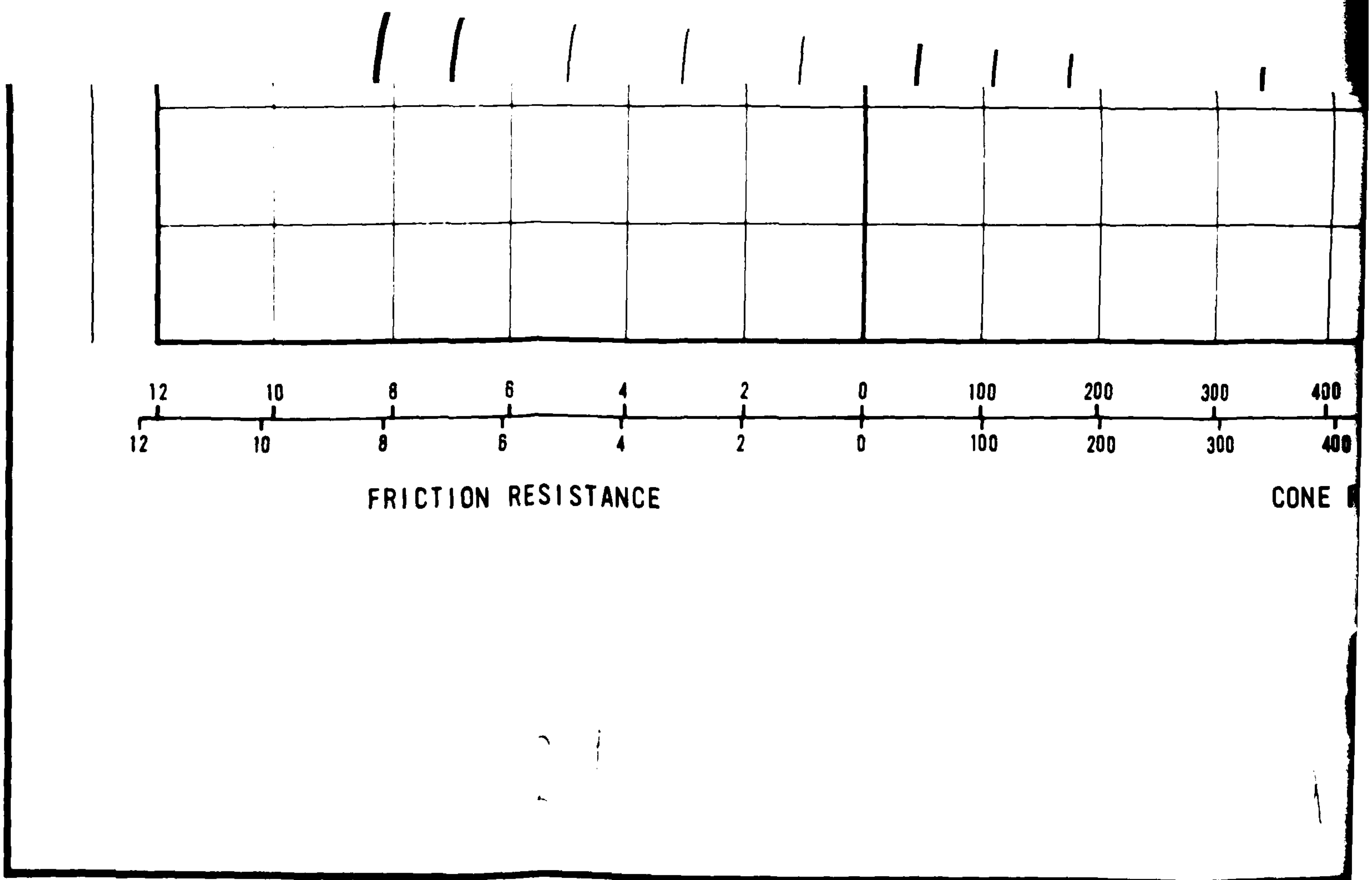
C - 51 SURFACE ELEVATION: 4810' (1466m)
SURFICIAL GEOLOGIC UNIT: A5i/A4
B - 1
GM
CS-52
C - 52 SURFACE ELEVATION: 4890' (1490m)
SURFICIAL GEOLOGIC UNIT: A5i/A4


FRICTION RATIO (9.1%)
FRICTION RATIO (9.6%)
FRICTION RATIO (9.5%)
1
52
2
4
8
12
5
6
7
8
9
10
11
12
13
14
15
16
15
20
25
30
35
40
45
50
55

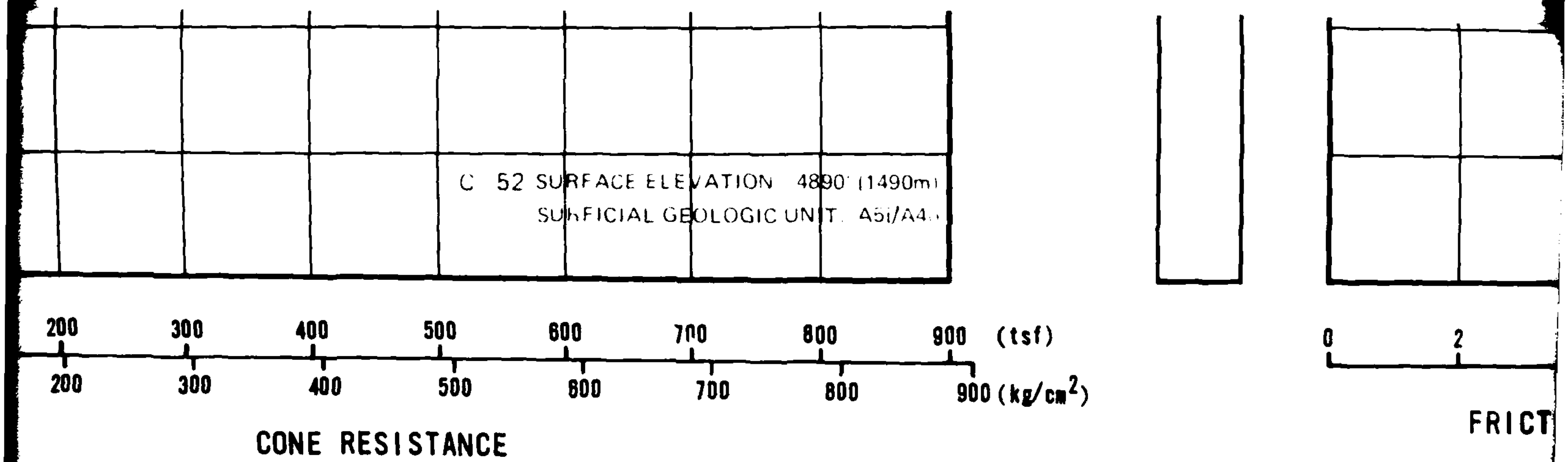

8 6 4 2 0 100 200 300 400 500 600 0



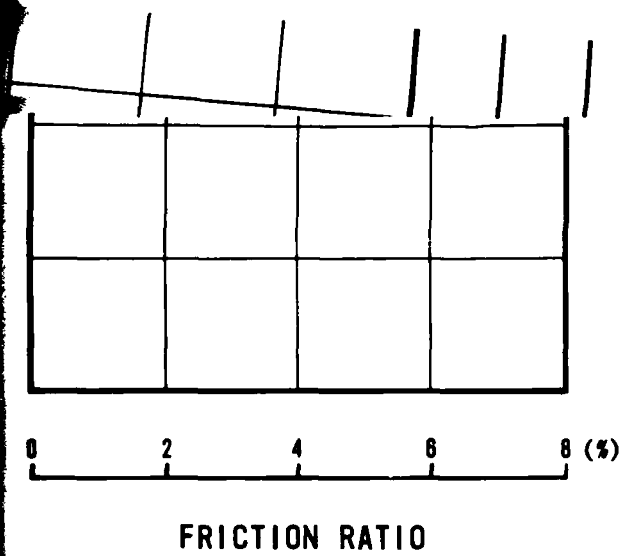
FRICTION RATIO (9.3
80

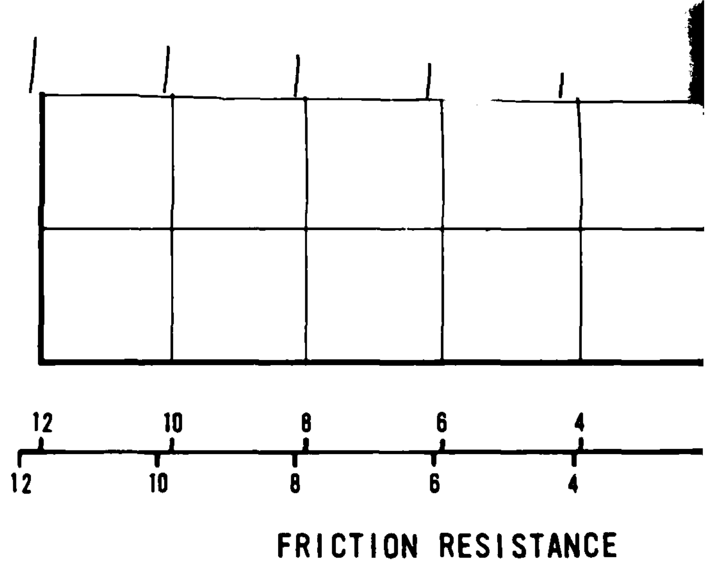


24 MAR 81

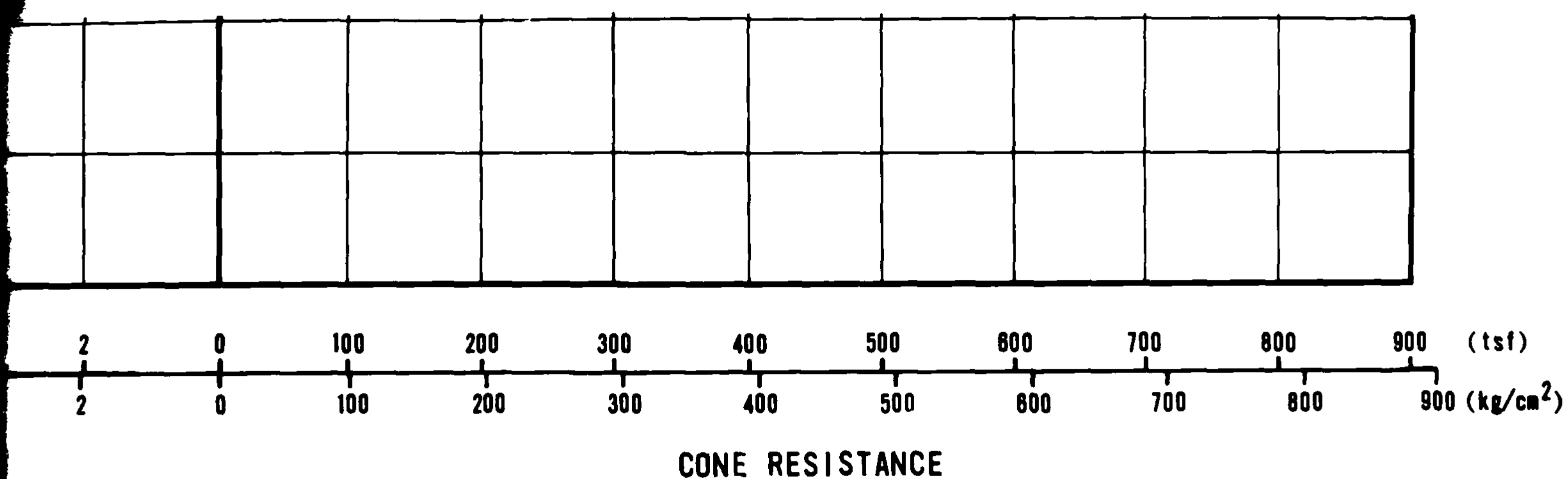

C 52 SURFACE ELEVATION 4890' (1490m)
SURFICIAL GEOLOGIC UNIT A5i/A4
200 300 400 500 600 700 800 900 (tsf)
200 300 400 500 600 700 800 900 (kg/cm2)
CONE RESISTANCE
0 2
FRICT

22

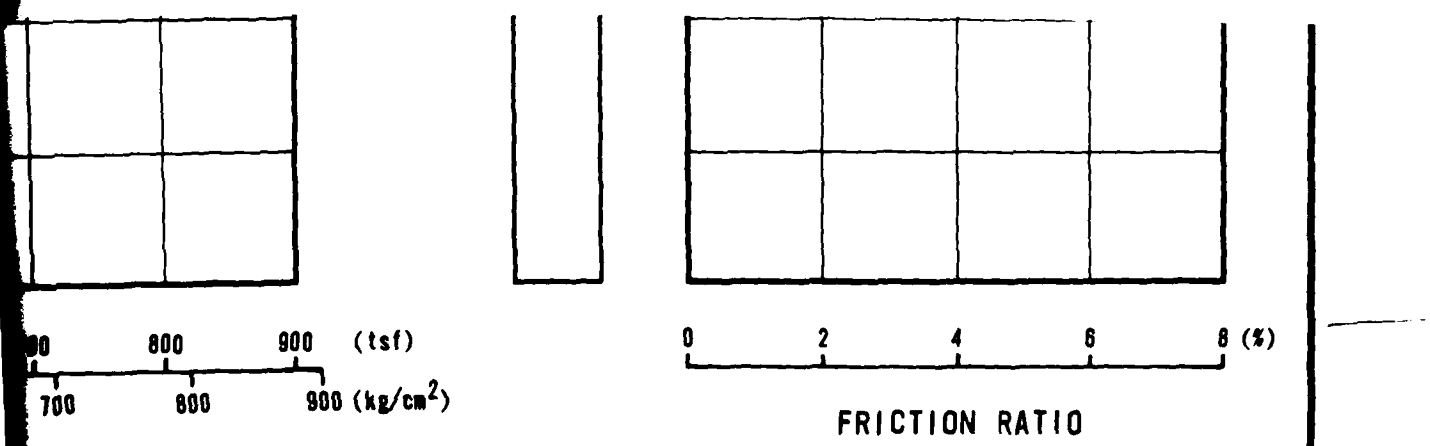

0 2 4 6 8 (%)
FRICTION RATIO


12 10 8 6 4
12 10 8 6 4
FRICTION RESISTANCE

23


2 0 100 200 300 400 500 600 700 800 900 (tsf)
2 0 100 200 300 400 500 600 700 800 900 (kg/cm2)
CONE RESISTANCE

24



CONE PENETROMETER TEST RESULTS
WAH WAH VALLEY, UTAH

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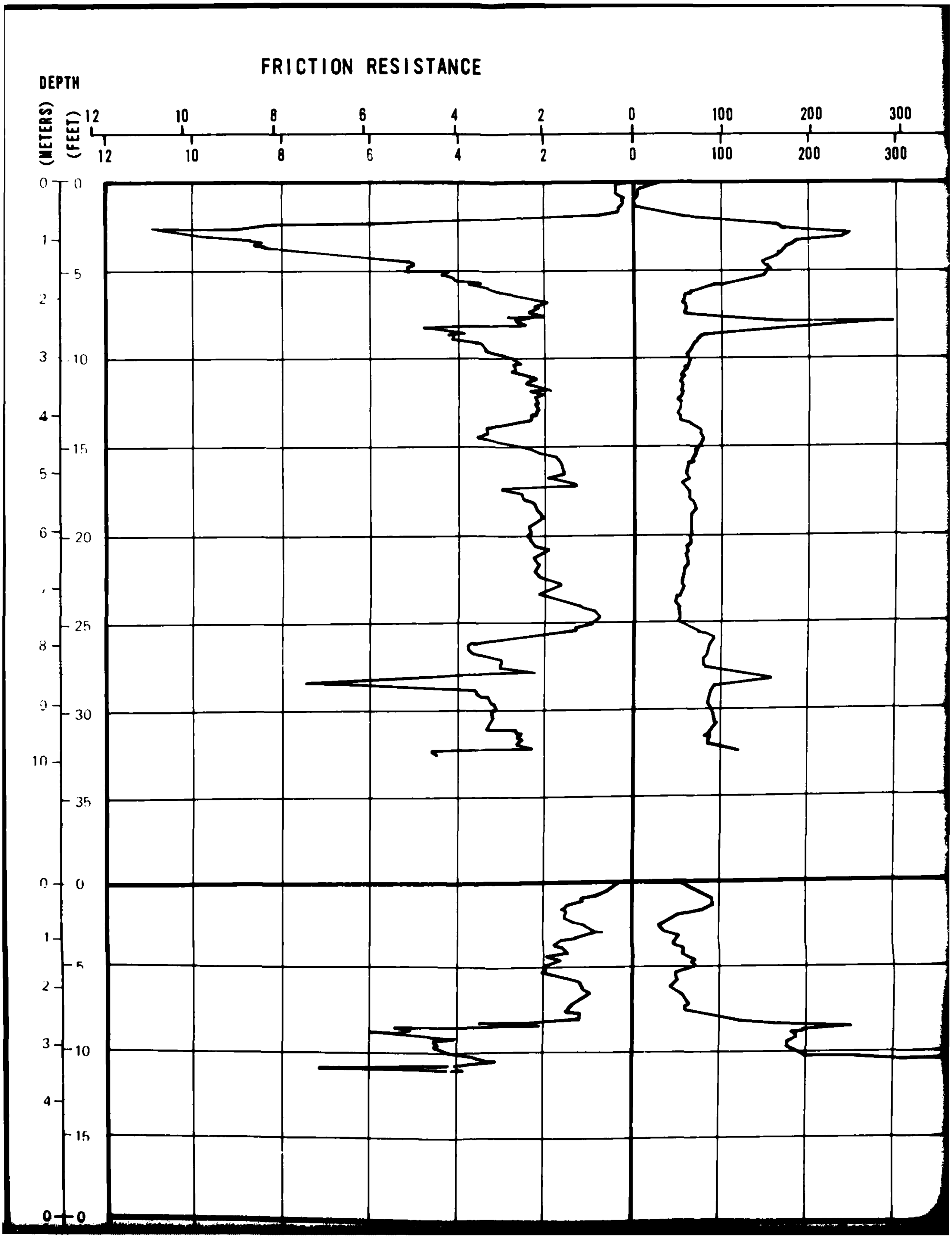
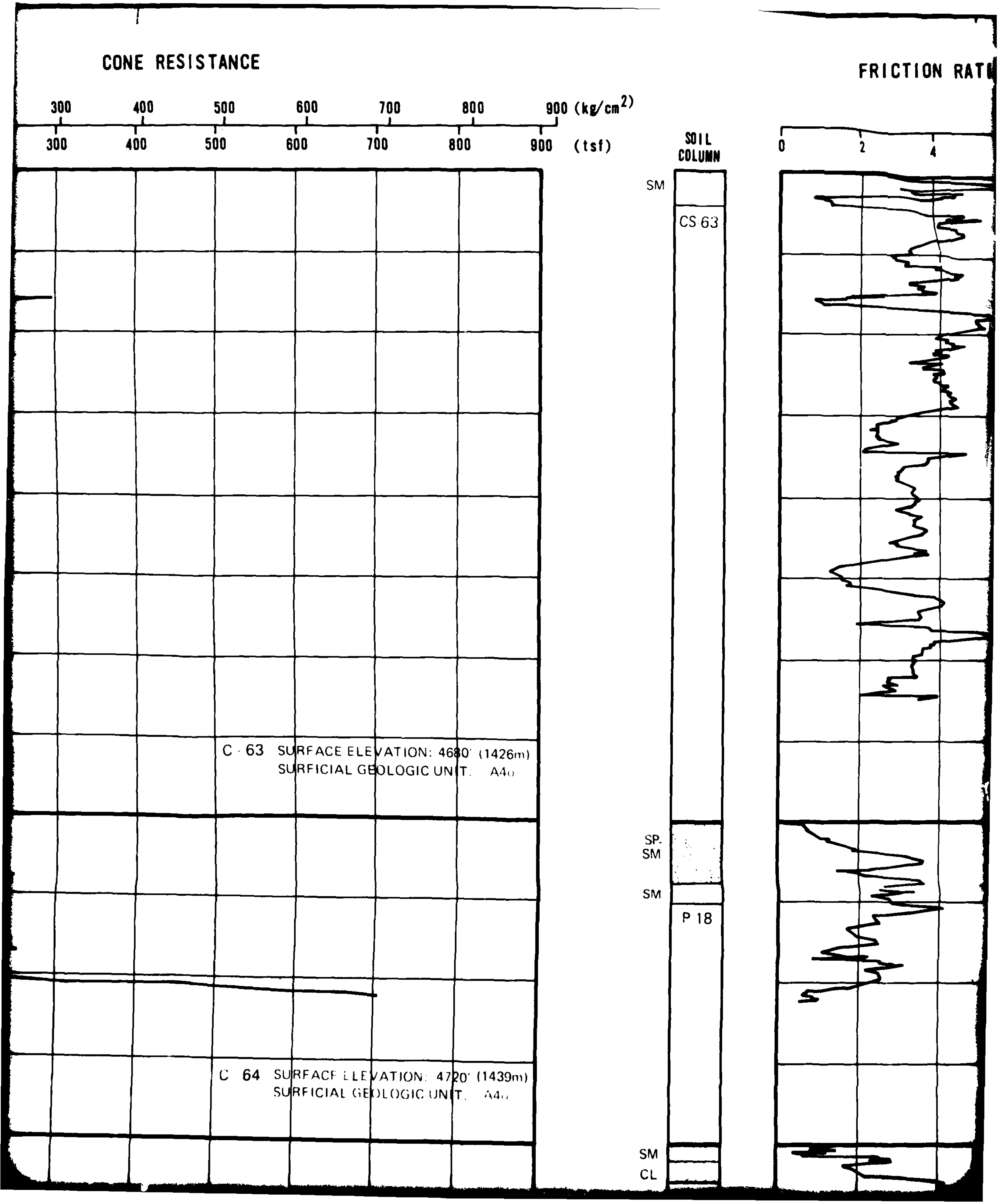
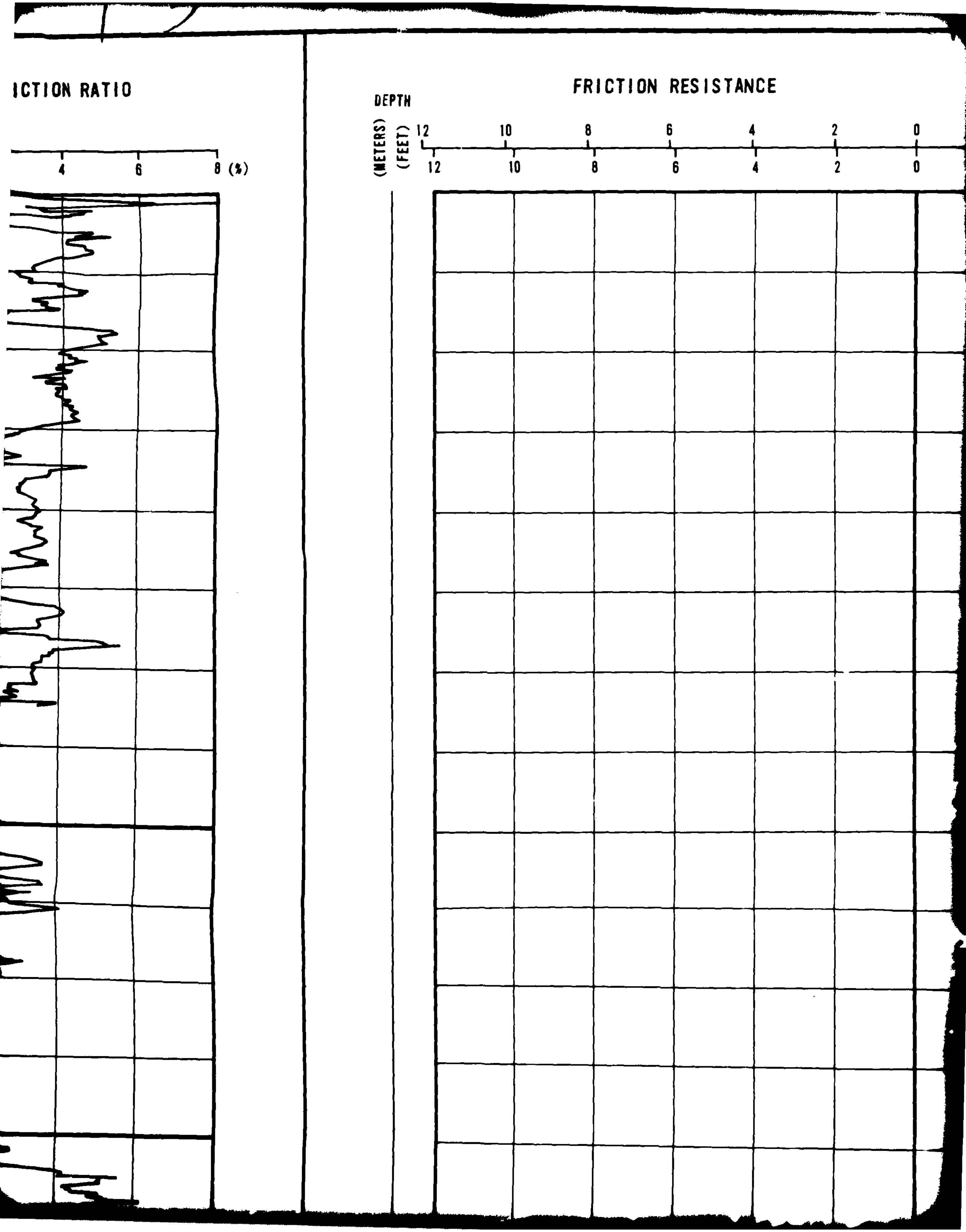
FUGRO NATIONAL, INC.

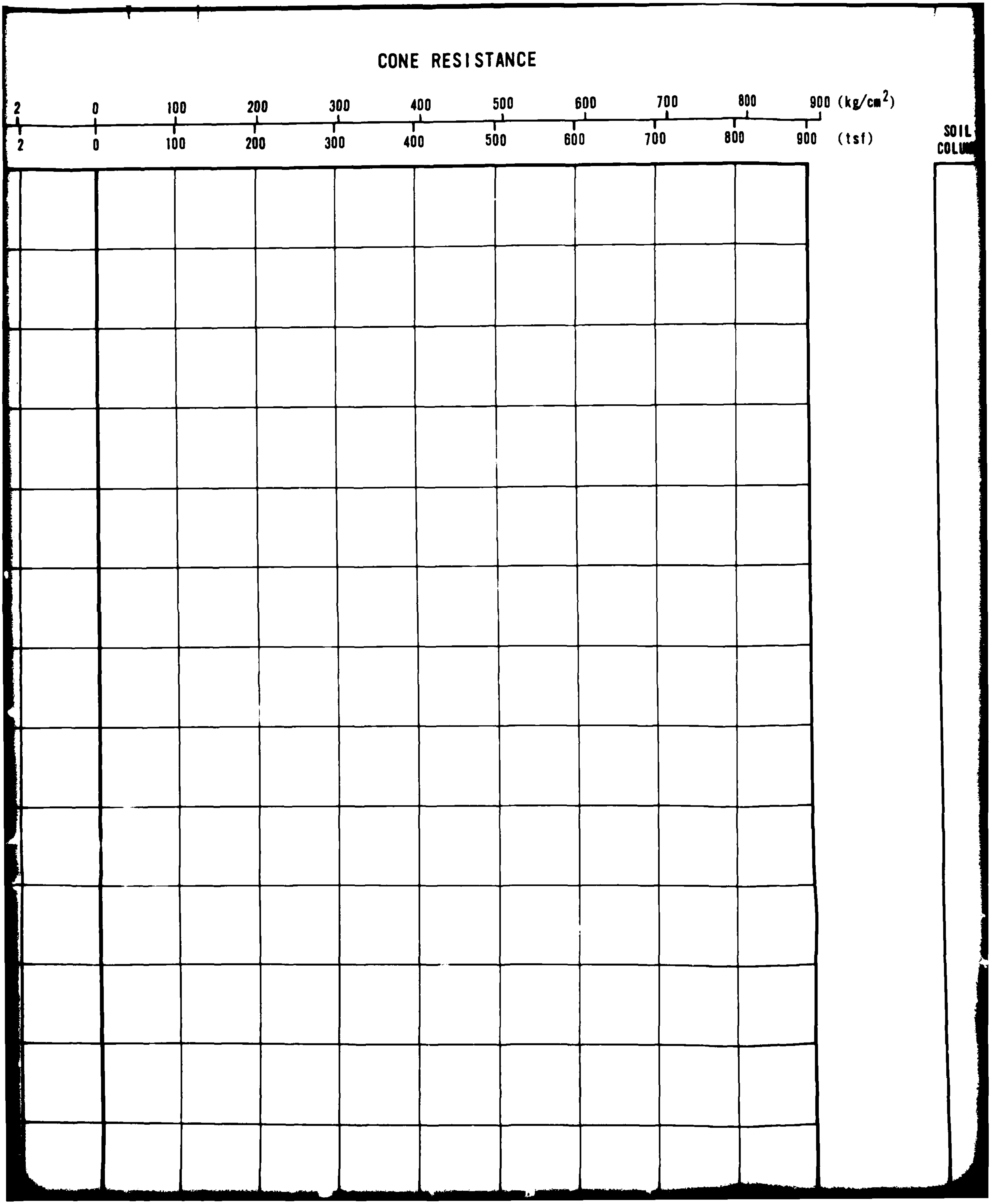


FRICTION RESISTANCE
DEPTH
(METERS)
(FEET)
12
10
8
6
4
2
0
100
200
300


CONE RESISTANCE
300 400 500 600 700 800 900 (kg/cm2)
300 400 500 600 700 800 900 (tsf)
SOIL COLUMN
FRICTION RAT
0 2 4
SM
CS 63
C · 63 SURFACE ELEVATION: 4680' (1426m)
SURFICIAL GEOLOGIC UNIT: A4
SP-SM
SM
P 18
C 64 SURFACE ELEVATION: 4720' (1439m)
SURFICIAL GEOLOGIC UNIT: A4
SM
CL



ICTION RATIO
4
6
8 (%)
FRICTION RESISTANCE
DEPTH
(METERS)
(FEET)
12
10
8
6
4
2
0
12
10
8
6
4
2
0


CONE RESISTANCE
2 0 100 200 300 400 500 600 700 800 900 (kg/cm2)
2 0 100 200 300 400 500 600 700 800 900 (tsf)
SOIL
COLU

15

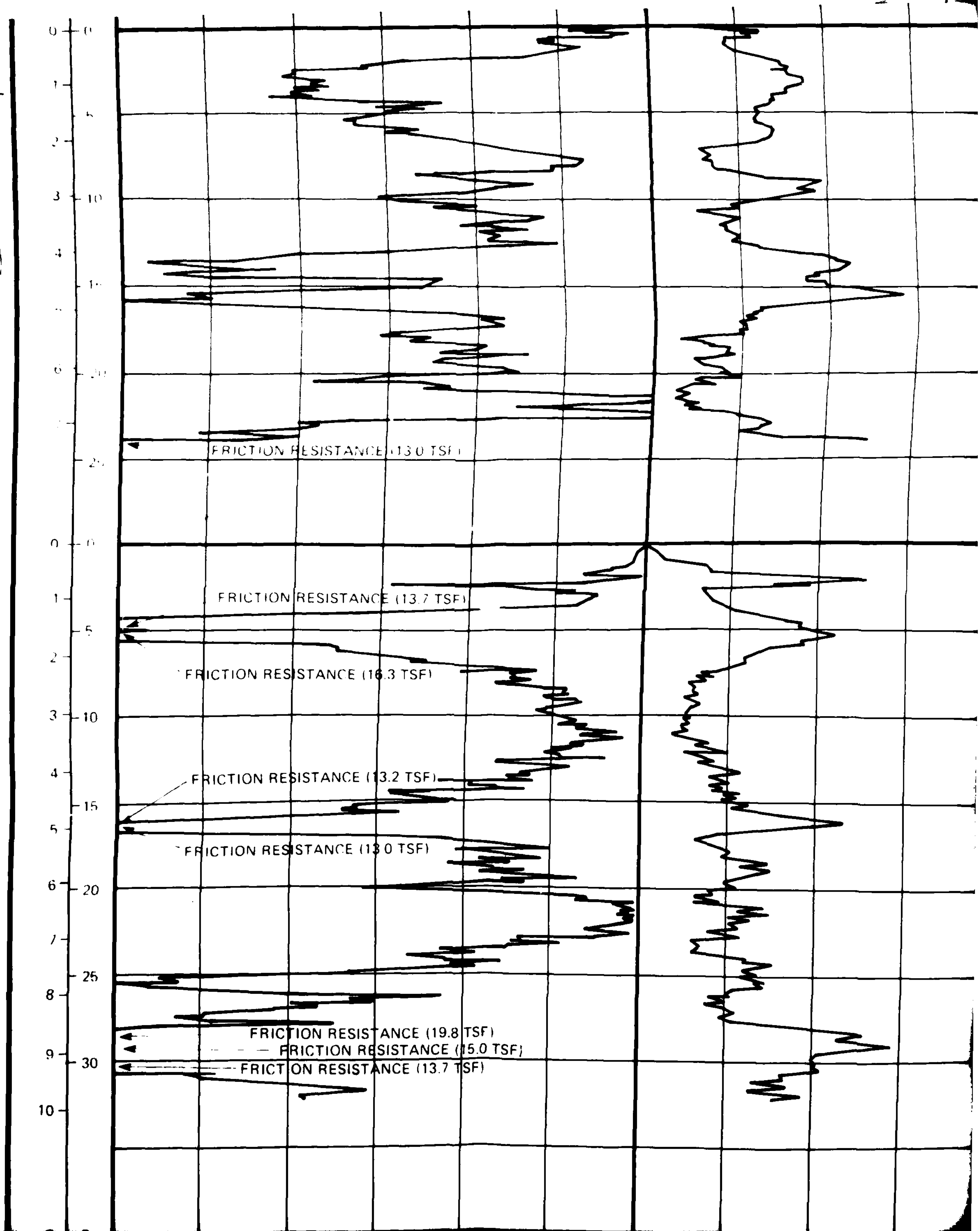
FRICTION RATIO

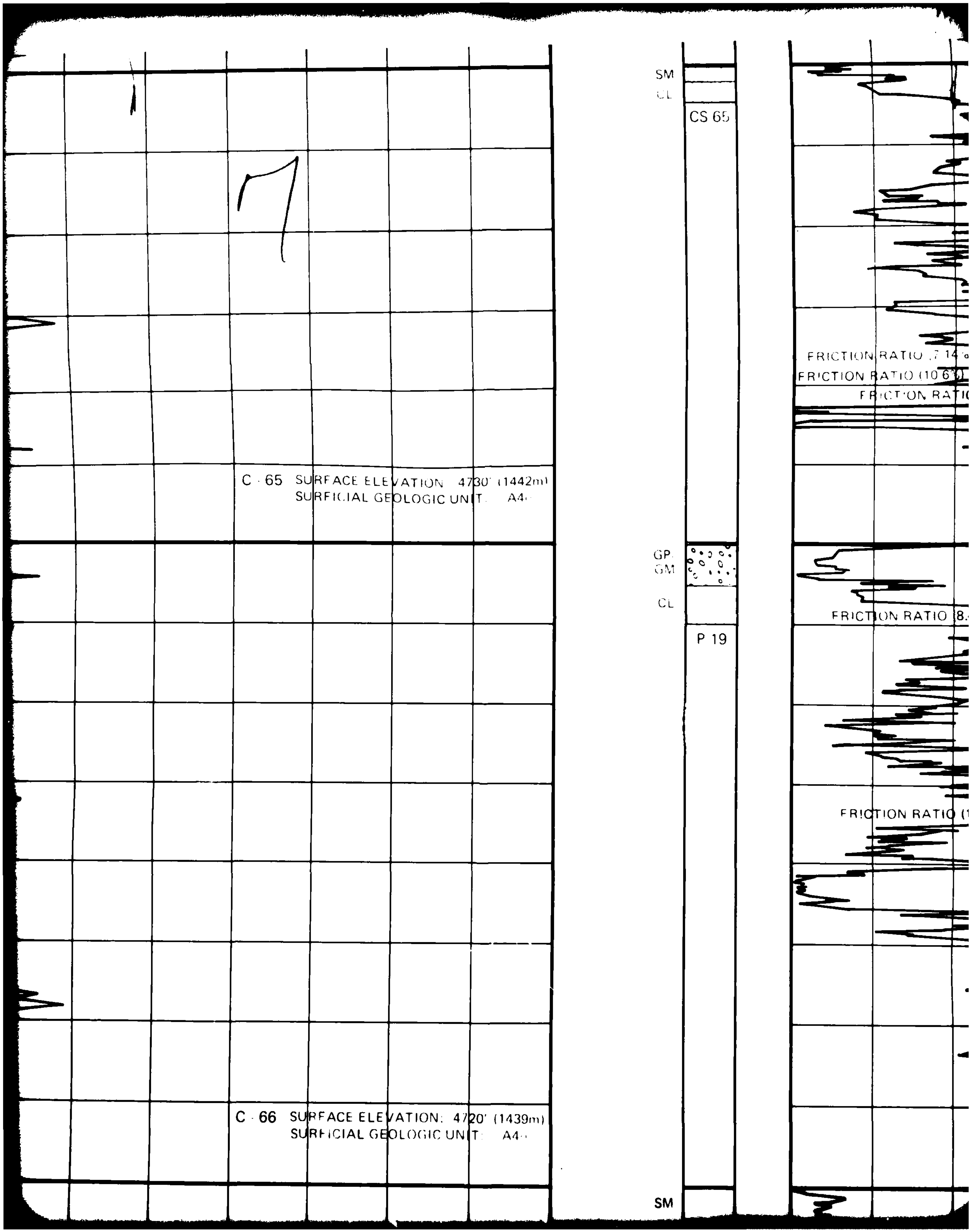
800 900 (kg/cm^2)

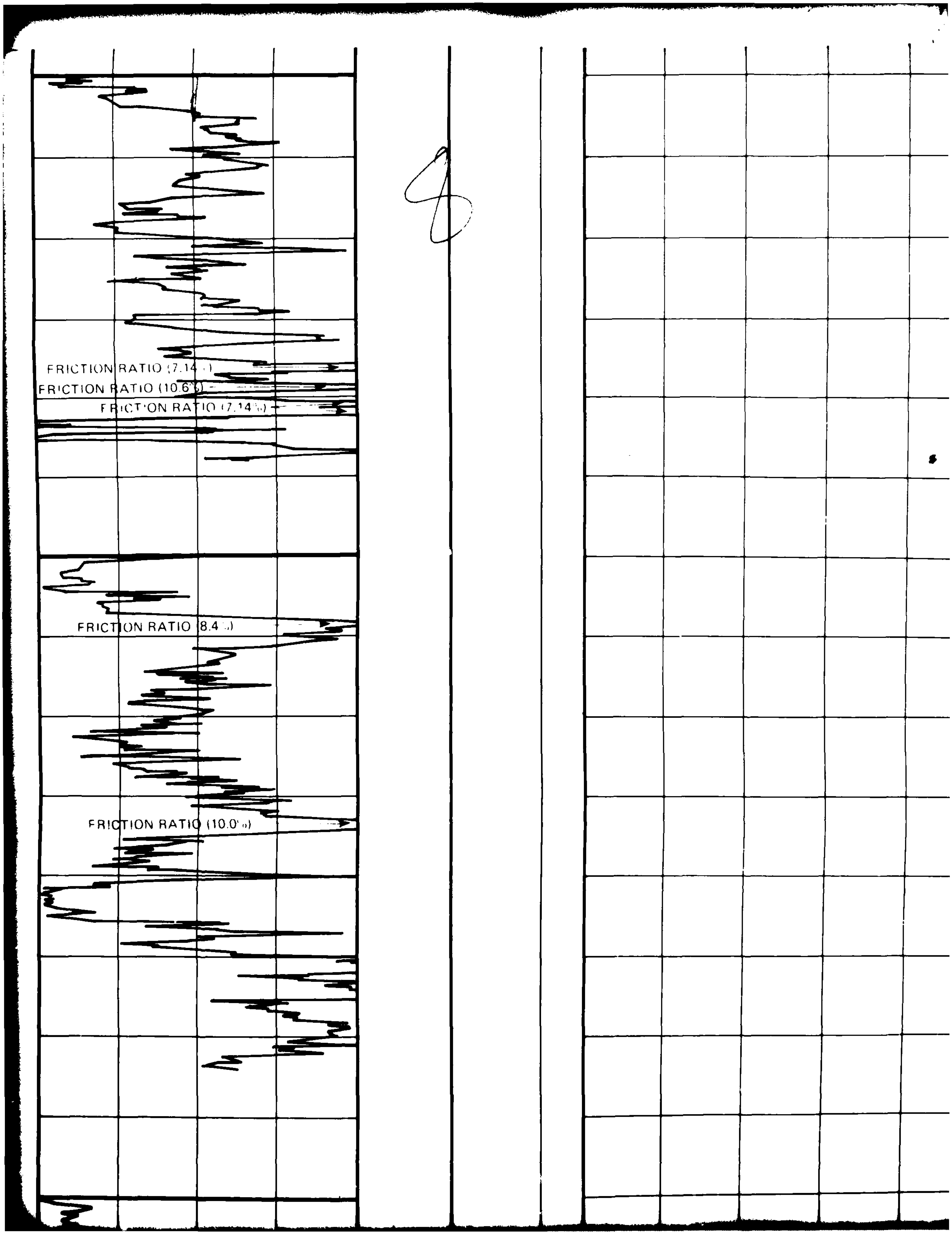
800 900 (tsf)

SOIL COLUMN

0 2 4 6 8 (%)


FRICTION RESISTANCE (13.0 TSF)
FRICTION RESISTANCE (13.7 TSF)
FRICTION RESISTANCE (16.3 TSF)
FRICTION RESISTANCE (13.2 TSF)
FRICTION RESISTANCE (13.0 TSF)
FRICTION RESISTANCE (19.8 TSF)
FRICTION RESISTANCE (15.0 TSF)
FRICTION RESISTANCE (13.7 TSF)
0
1
2
3
4
5
6
7
8
9
10
5
10
15
20
25
30


7
C - 65 SURFACE ELEVATION 4730' (1442m)
SURFICIAL GEOLOGIC UNIT: A4
SM
CL
CS 65
FRICTION RATIO
FRICTION RATIO (10.6%)
FRICTION RATIO
GP-GM
CL
P 19
FRICTION RATIO
FRICTION RATIO
C - 66 SURFACE ELEVATION: 4720' (1439m)
SURFICIAL GEOLOGIC UNIT: A4
SM


FRICTION RATIO (7.14%)
FRICTION RATIO (10.6%)
FRICTION RATIO (7.14%)
FRICTION RATIO (8.4%)
FRICTION RATIO (10.0%)

AD-A113 393 FUGRO NATIONAL INC LONG BEACH CA F/G 13/2
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MAR 81 F04704-80-C-0006
UNCLASSIFIED FN-TR-27-WA-VOL-2 NL

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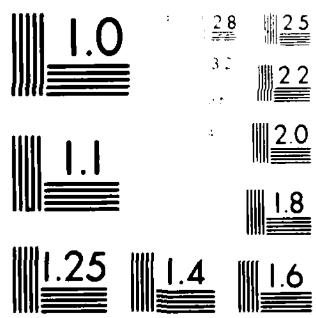
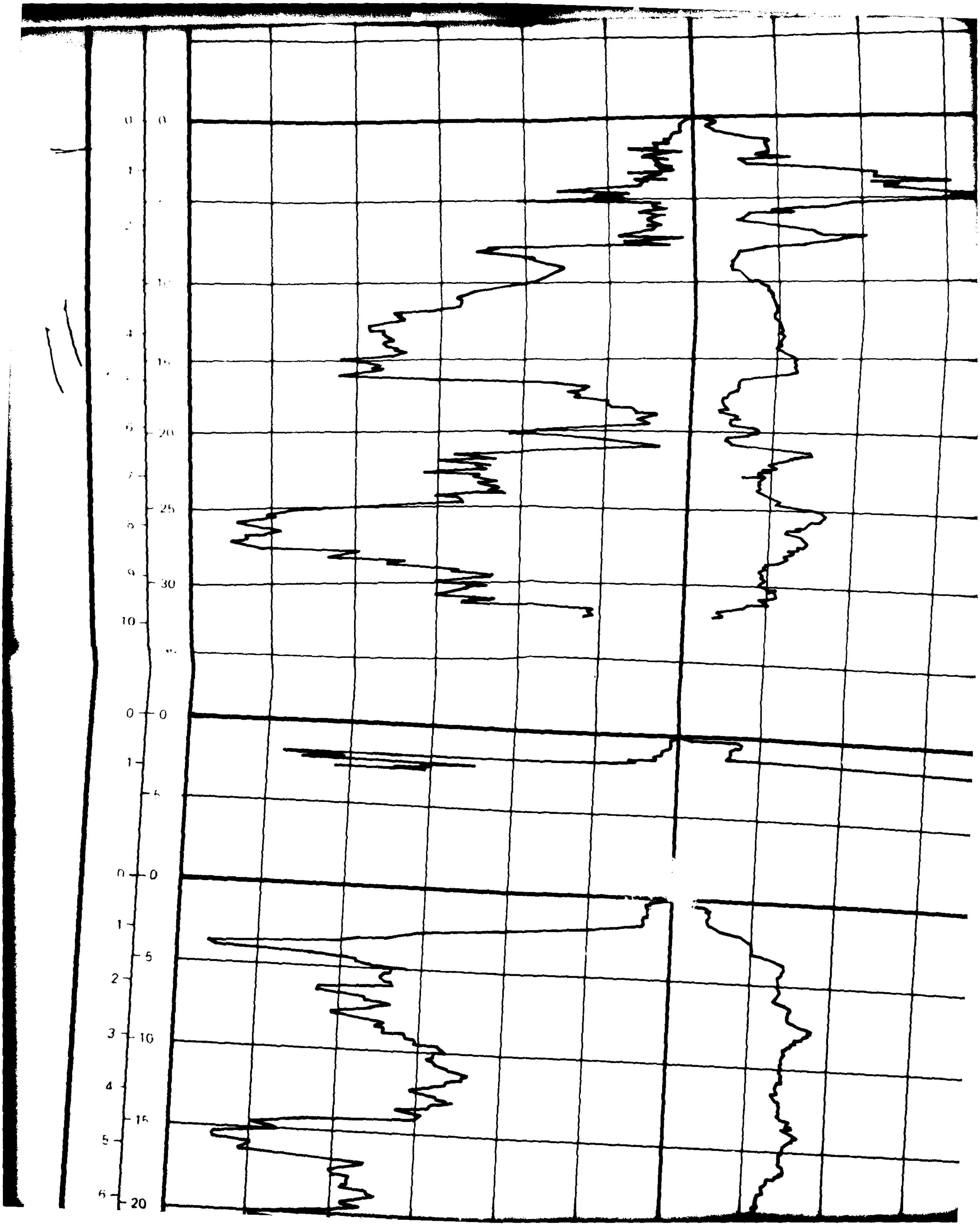


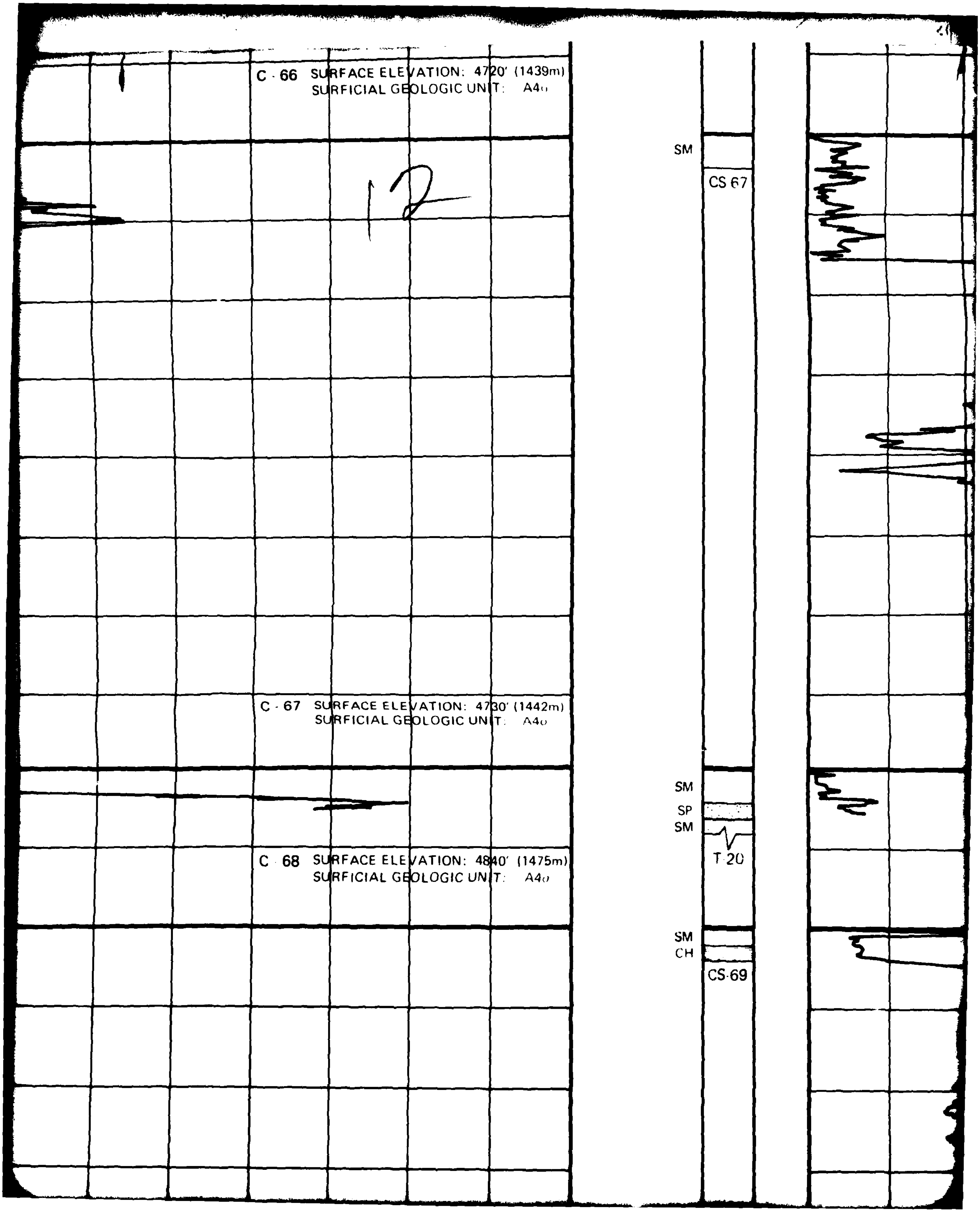
9

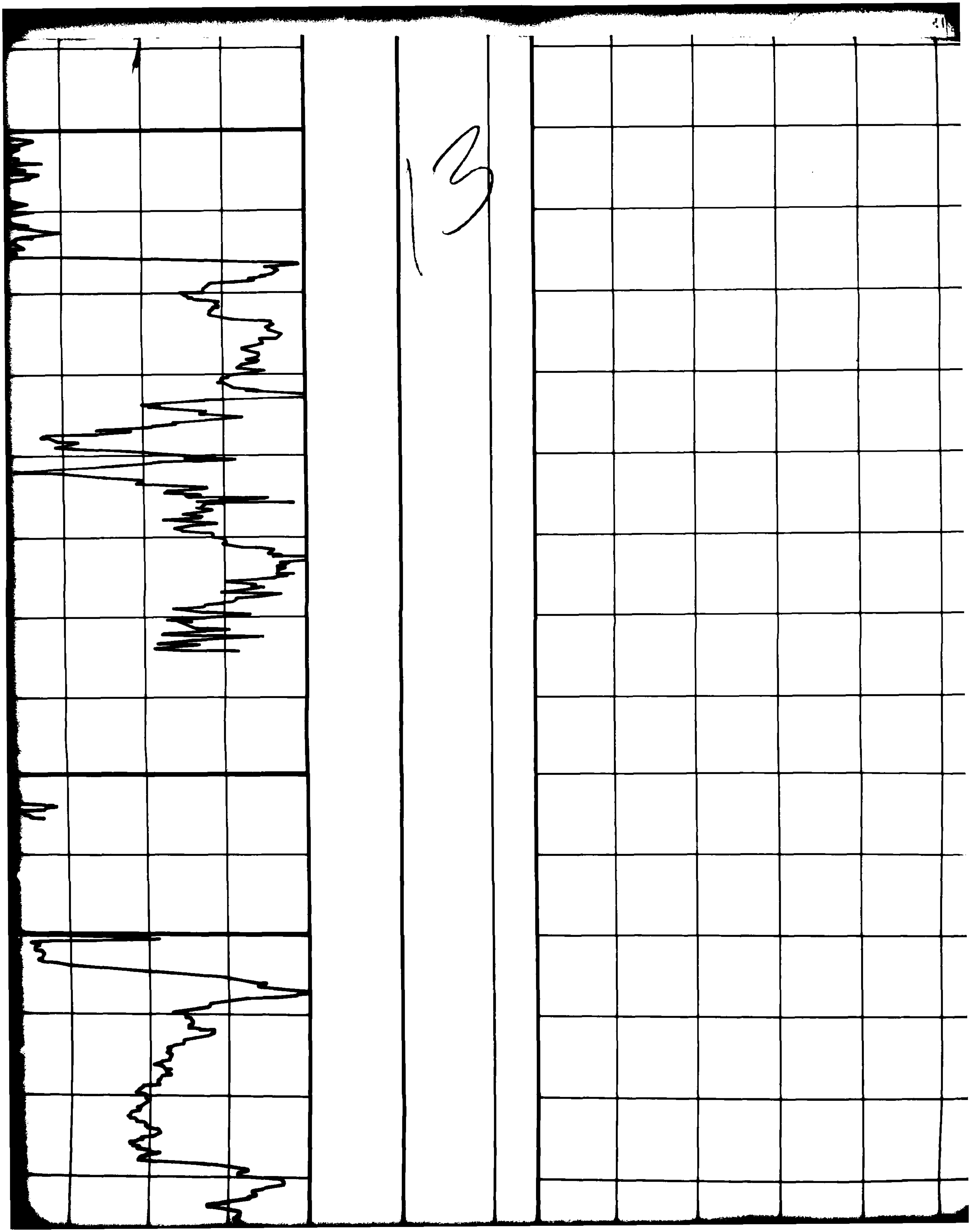
1

10



0
1
2
3
4
5
6
5
10
15
20
25
30


C - 66 SURFACE ELEVATION: 4720' (1439m)
SURFICIAL GEOLOGIC UNIT: A4o
12
SM
CS 67
C - 67 SURFACE ELEVATION: 4730' (1442m)
SURFICIAL GEOLOGIC UNIT: A4o
SM
SP
SM
T 20
C - 68 SURFACE ELEVATION: 4840' (1475m)
SURFICIAL GEOLOGIC UNIT: A4o
SM
CH
CS-69


13

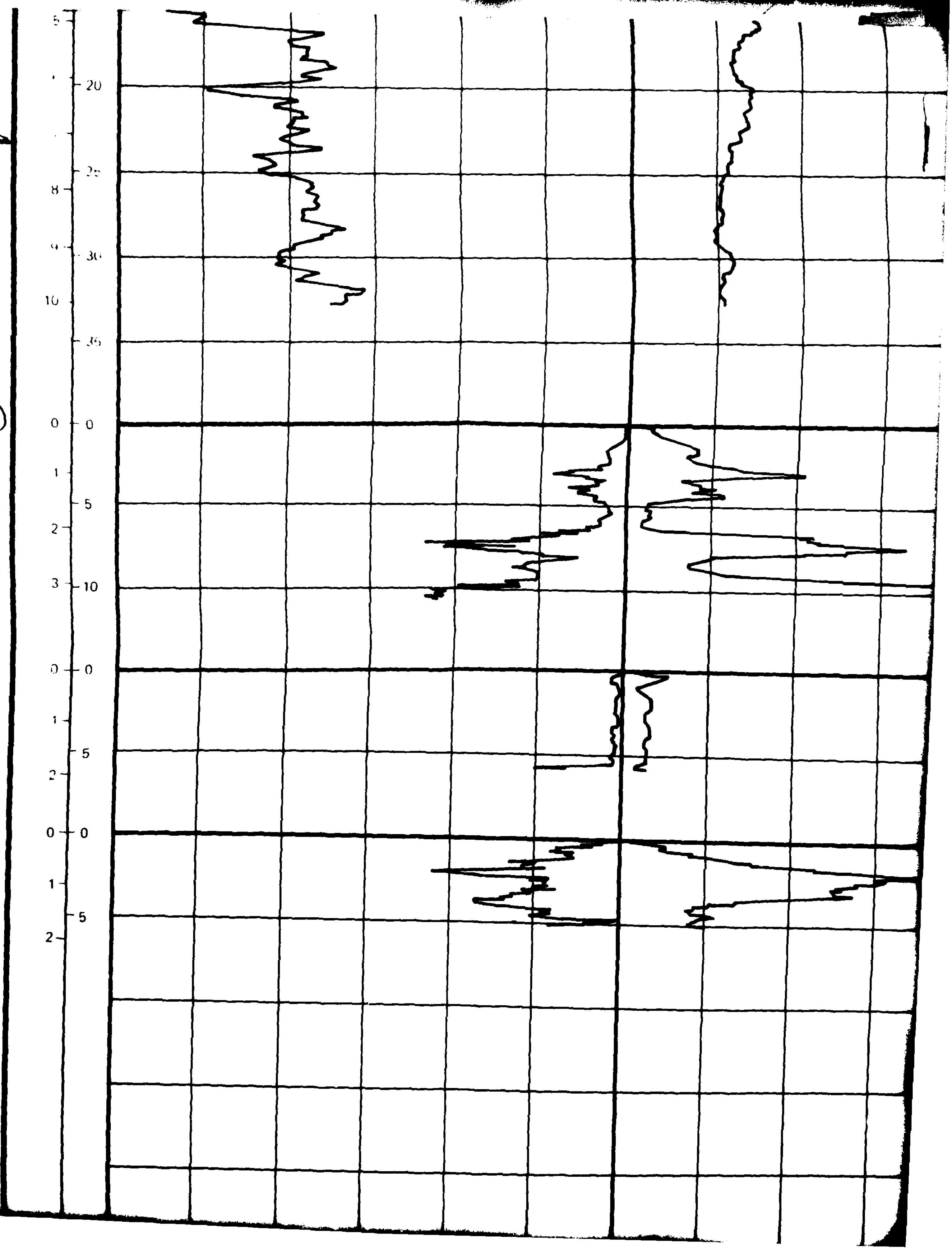
14

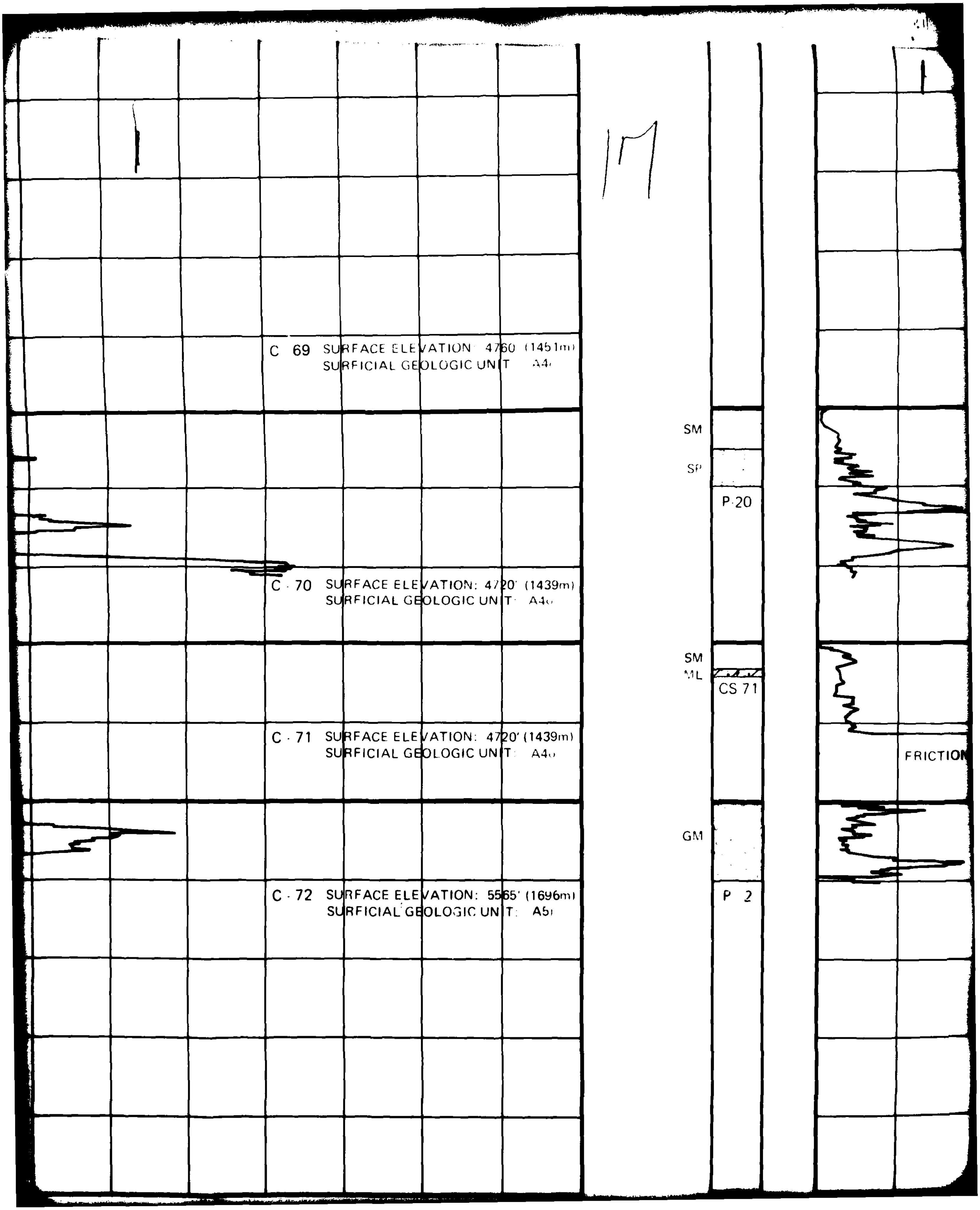
1

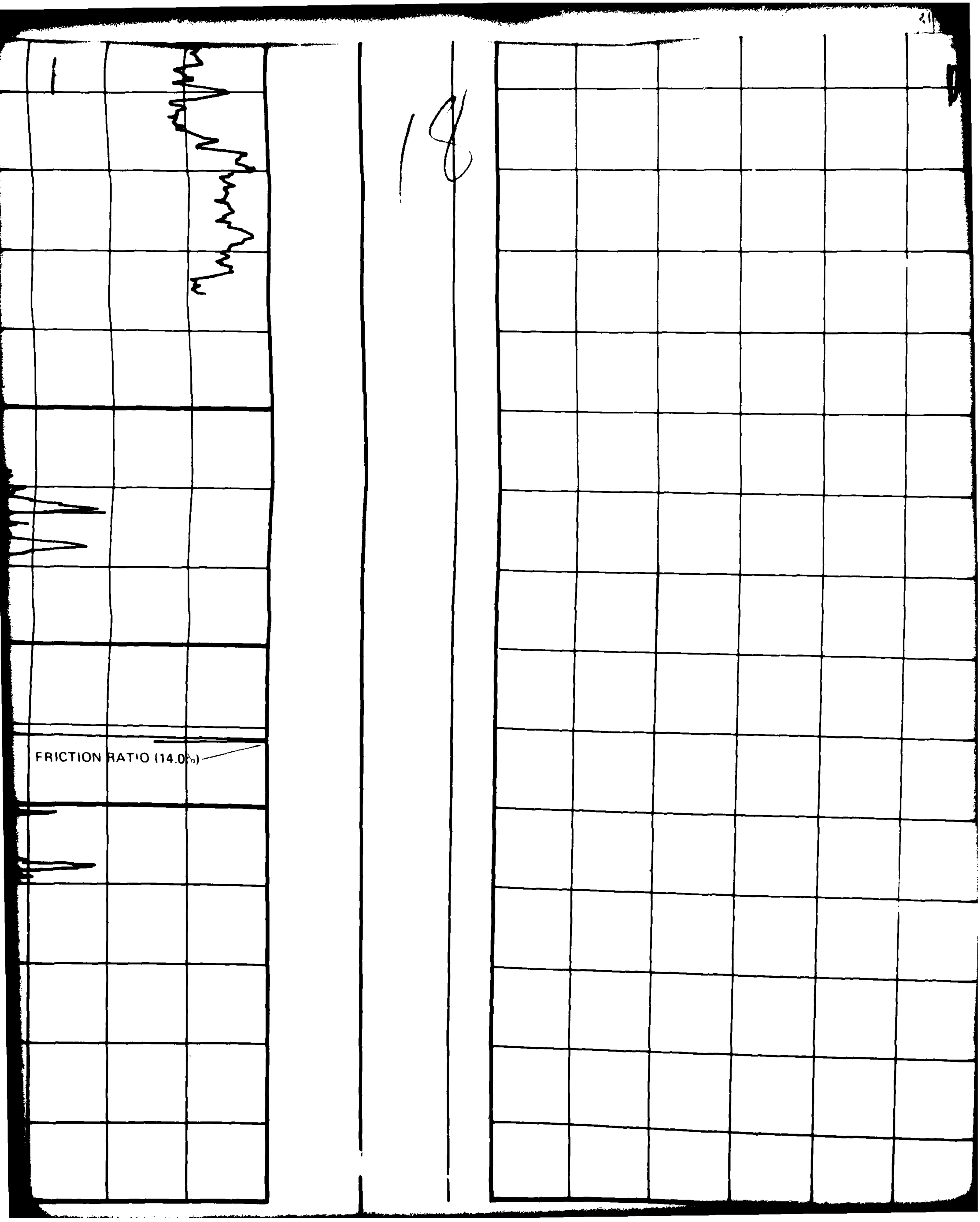
—

15

16

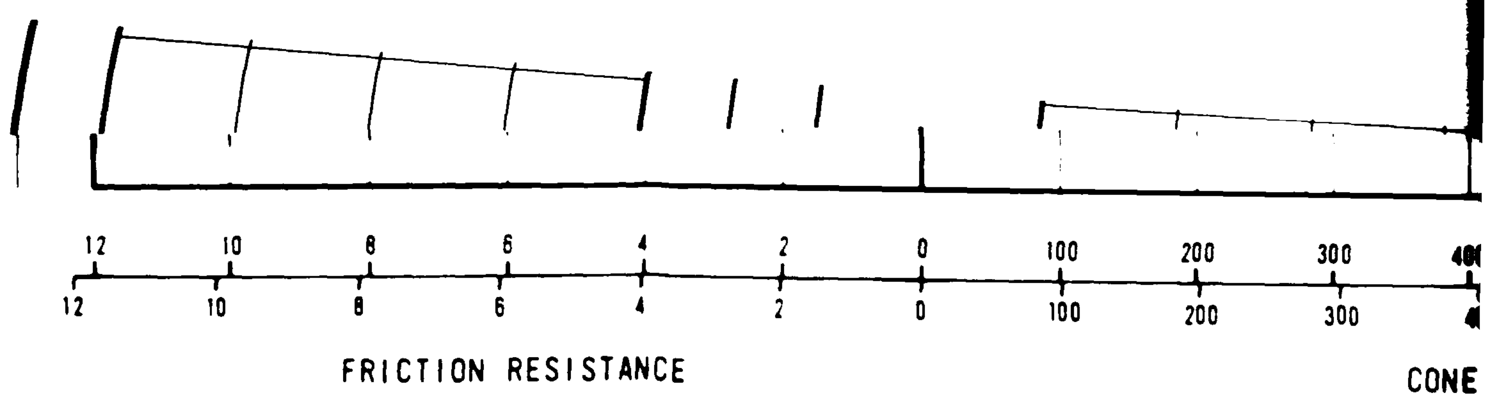


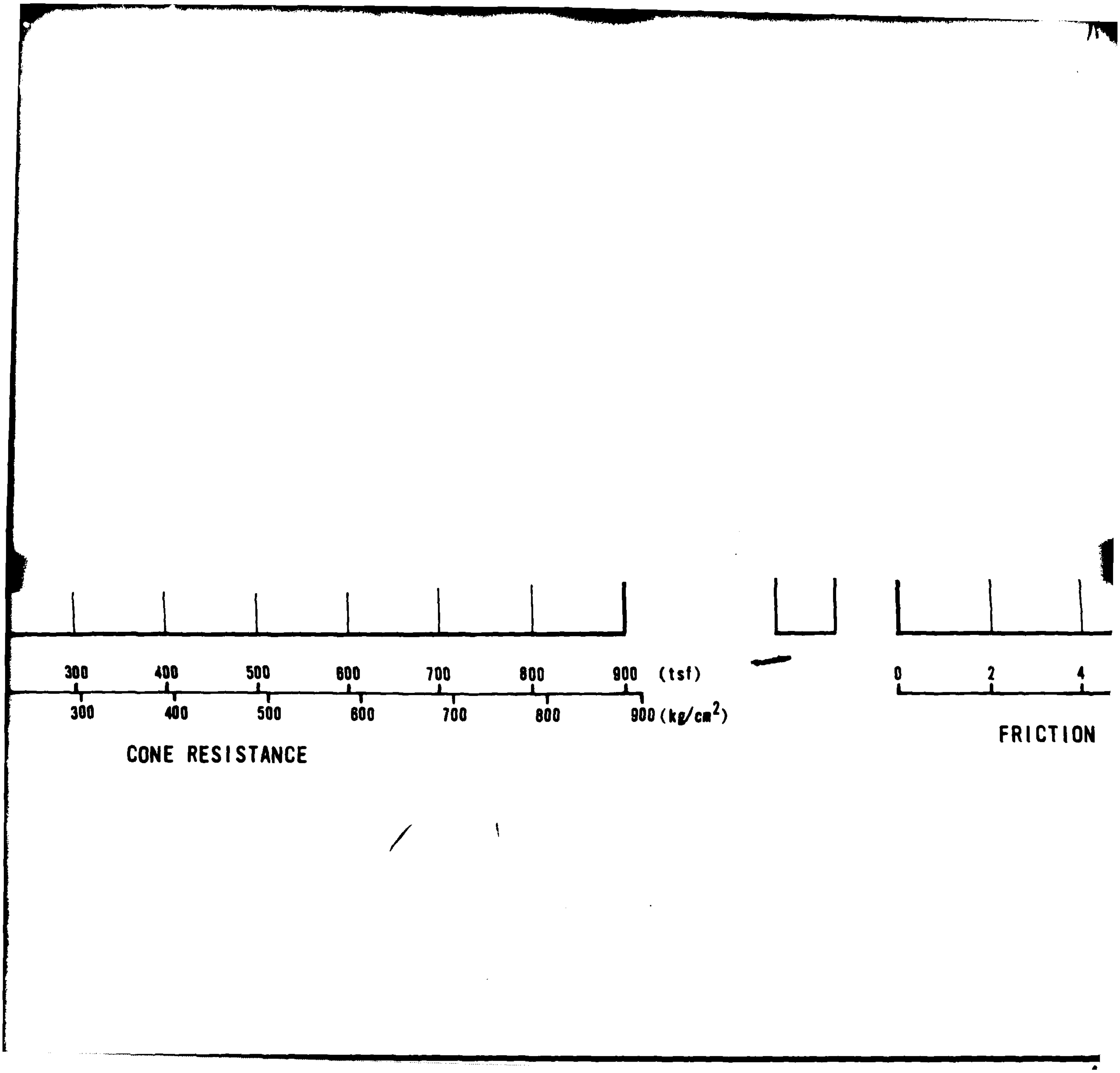

17
C 69 SURFACE ELEVATION: 4760 (1451m)
SURFICIAL GEOLOGIC UNIT: A4
SM
SP
P-20
C - 70 SURFACE ELEVATION: 4720' (1439m)
SURFICIAL GEOLOGIC UNIT: A4
SM
ML
CS 71
C - 71 SURFACE ELEVATION: 4720' (1439m)
SURFICIAL GEOLOGIC UNIT: A4
FRICTION
GM
C - 72 SURFACE ELEVATION: 5565' (1696m)
SURFICIAL GEOLOGIC UNIT: A5
P 2

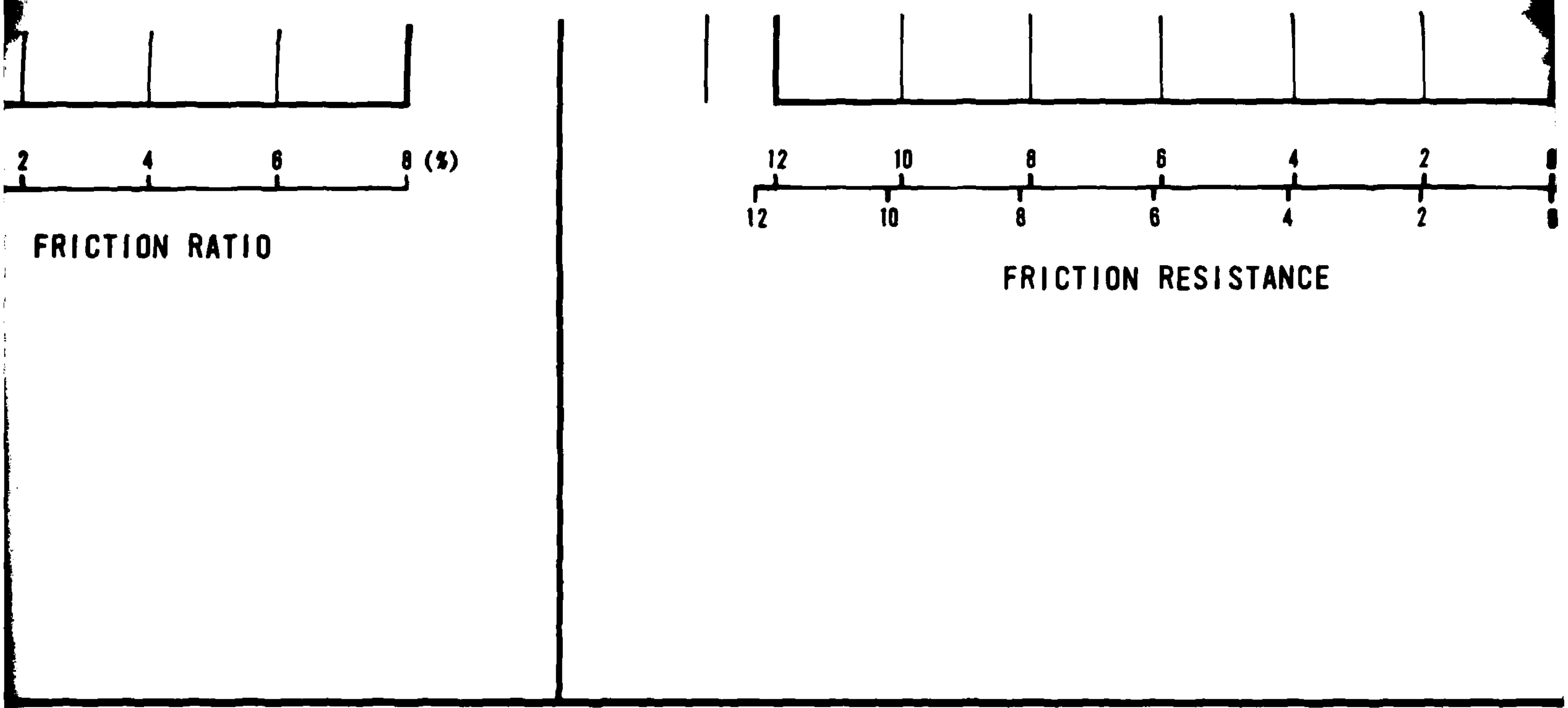

18
FRICTION RATIO (14.0%)

19

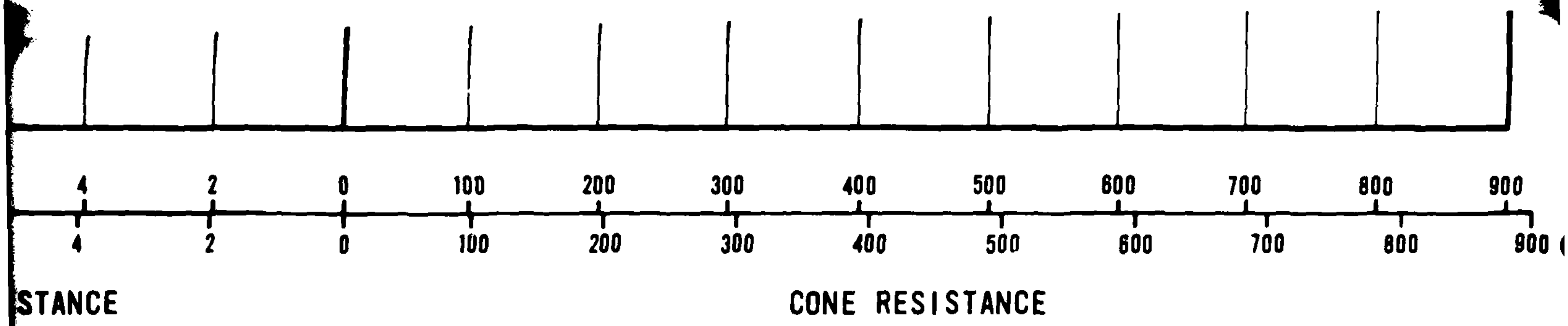
20


12 10 8 6 4 2 0 100 200 300
12 10 8 6 4 2 0 100 200 300
FRICTION RESISTANCE
CONE


300 400 500 600 700 800 900 (tsf)
300 400 500 600 700 800 900 (kg/cm2)
CONE RESISTANCE
0 2 4
FRICTION

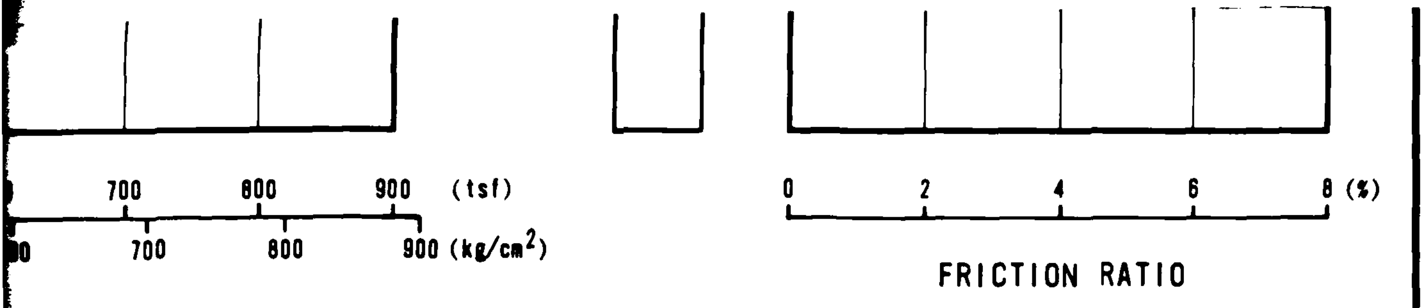

2 4 6 8 (%)
FRICTION RATIO
12 10 8 6 4 2 0
12 10 8 6 4 2 0
FRICTION RESISTANCE

23



4 2 0 100 200 300 400 500 600 700 800 900
4 2 0 100 200 300 400 500 600 700 800 900 (
STANCE
CONE RESISTANCE

24



CONE PENETROMETER TEST RESULTS
WAH WAH VALLEY, UTAH

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - BMO

DRAWING
II-1

FUGRO NATIONAL, INC.

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